SCIENTIFIC TERRESTRIAL SERVICES

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BIODIVERSITY ASSESSMENT AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND AUTHORISATION PROCESS FOR THE PROPOSED EXPANSION AND UPGRADE FOR ACTIVITIES ASSOCIATED WITH THE BEESHOEK MINE, NEAR POSTMASBURG, NORTHERN CAPE PROVINCE

Prepared for

Envirogistics (Pty) Ltd

July 2021

Section C: Faunal Assessment

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Report Reference: STS 190023

DOCUMENT GUIDE

The table below provides a guide to the reporting of biodiversity impacts as they relate to 1) Government Notice No. 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Biodiversity** as published in Government Gazette 43110 dated 20 March 2020, and 2) Government Notice No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Plant and Animal Species** as published in Government Gazette 43855 dated 30 October 2020.

Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
No.	**SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS**	**Section in report/Notes**
2	**Terrestrial Biodiversity Specialist Assessment**	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	**Part A – C:** Cover Pages **Part A:** Appendix E
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	**Part A**: Section 1
2.3	**The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:**	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	**Part B**: Section 3 (flora) **Part C:** Section 3 (vertebrates)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	**Part B**: Section 3 (flora) **Part C:** Section 3 (vertebrates)
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	**Part A:** Section 3 (desktop analysis) **Part B**: Section 3 (flora) **Part C:** Section 3 (vertebrates)
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Area (FEPA) sub catchments;	**Part A:** Section 3 (desktop analysis) **Part B:** Section 3 (flora) **Part C:** Section 3 (vertebrates) **For descriptions on the presence of FEPAs, please refer to the Freshwater Biodiversity Assessment (SAS 219099, 2021)*
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	**Part A**: Section 3 (desktop analysis) **Part B:** Section 3 (flora) **Part C:** Section 3 (vertebrates)
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Not Applicable.
2.3.7	**The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:**	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: *a) the reasons why an area has been identified as a CBA;* *b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;*	**Part A**: Section 3 (desktop analysis) **Part B**: Section 3 and 5.3.3

	c) *the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);* d) *the impact on ecosystem threat status;* e) *the impact on explicit subtypes in the vegetation;* f) *the impact on overall species and ecosystem diversity of the site; and* g) *the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: a) *the impact on the ecological processes that operate within or across the site;* b) *the extent the proposed development will impact on the functionality of the ESA; and* c) *loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- a) *an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	**Part A**: Section 3 (desktop analysis) However, not applicable as there are no protected areas within 10 km of the site.
2.3.7.4	Priority areas for protected area expansion, including- a) *the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;*	**Part A**: Section 3 (desktop analysis)
2.3.7.5	SWSAs including: a) *the impact(s) on the terrestrial habitat of a SWSA; and* b) *the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);*	Not Applicable
2.3.7.6	FEPA sub catchments, including- a) *the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;*	**For descriptions on the presence of FEPAs, please refer to the Freshwater Biodiversity Assessment (SAS 219099, 2021)*
2.3.7.7	Indigenous forests, including: a) *impact on the ecological integrity of the forest; and* b) *percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.*	Not Applicable
2.4	**The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.**	
	Part B: Results of the **Floral Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities. **Part C:** Results of the **Vertebrate Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities. **Part D:** Results of the **Invertebrate Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities.	
3	**Terrestrial Biodiversity Specialist Assessment Report**	
3.1	**The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:**	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	**Part A:** Appendix E
3.1.2	A signed statement of independence by the specialist;	**Part A:** Appendix E
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	**Part B:** Section 1.3 (flora) **Part C:** Section 1.3 (vertebrates)

3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	**Part A**: Appendix C **Part B:** Section 2 (flora) **Part B:** Appendix A (flora) **Part C:** Section 2 (fauna) **Part C**: Appendix A (fauna)
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	**Part B:** Section 1.3 (flora) **Part C:** Section 1.3 (vertebrates)
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	**Part B:** Section 4 (flora) **Part C:** Section 4 (vertebrates)
	Impact Assessment Requirements 3.1.7 Additional environmental impacts expected from the proposed development; 3.1.8 Any direct, indirect and cumulative impacts of the proposed development; 3.1.9 The degree to which impacts and risks can be mitigated; 3.1.10 The degree to which the impacts and risks can be reversed; 3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources; 3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	**Part B:** Section 5 (flora) **Part C:** Section 5 (vertebrates)
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	**Not Applicable to this report**
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Executive summary **Part B:** Section 6 (flora) **Part C:** Section 6 (vertebrates)
3.1.15	Any conditions to which this statement is subjected.	**Part B:** Section 5.4 (flora) **Part C:** Section 5.4 (vertebrates)
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	**Not Applicable to this report. Responsibility of the EAP.**
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	This report is submitted to the EAP and applicant and will be appended to the EIA / EMP by the EAP in due course as part of the application process.

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ACRONYMS

BGIS	Biodiversity Geographic Information Systems
CR	Critically Endangered
DAFF	Department: Agriculture, Forestry and Fisheries
EAP	Environmental Assessment Practitioner
EIS	Ecological Importance and Sensitivity
EN	Endangered
EW	Extinct in the Wild
GIS	Geographic Information System
GPS	Global Positioning System
IBA	Important Bird Area
IEM	Integrated Environmental Management
IUCN	International Union for Conservation of Nature and Natural Resources
LC	Least Concern
NT	Near Threatened
NYBA	Not yet been assessed
P	Protected
PES	Present Ecological State
POC	Probability of Occurrence
PRECIS	Pretoria Computerised Information System
QDS	Quarter Degree Square
RDL	Red Data Listed
RE	Regionally Extinct
SABAP	Southern African Bird Atlas Project
SANBI	South Africa National Biodiversity Institute
STS	Scientific Terrestrial Services
SCC	Species of Conservation Concern
TOPS	Threatened or Protected Species
VU	Vulnerable

GLOSSARY OF TERMS

Alien and Invasive species	A species that is not an indigenous species; or an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
CBA (Critical Biodiversity Area)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation and ridges.
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
ESA (Ecological Support Area)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Least Threatened	Least threatened ecosystems are still largely intact.
RDL (Red Data listed) species	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
SCC (Species of Conservation Concern)	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.

1. INTRODUCTION

Scientific Terrestrial Services CC (STS) was appointed to conduct Biodiversity and Impact Assessment as part of the Environmental Impact Assessment (EIA) and Authorisation process for the consolidation, upgrade and expansion activities at the Assmang (Pty) Ltd Beeshoek Iron Ore Mine, near Postmasburg, Northern Cape Province; henceforth referred to as the "Beeshoek Mine". The proposed consolidation, upgrade and expansion activities will take place within the Beeshoek Mine's Surface Rights Area (SRA).

The Beeshoek Mine holds an existing Mining Right on the farms Beeshoek 448, and Olynfontein 475 and is situated within the Tsantsabane Local Municipality, and the ZF Mgcawu District Municipality. The Beeshoek Mine is situated approximately 7 km west of the town of Postmasburg, and 70 km south of Kathu. The Beeshoek Mine is traversed by the R385 regional road, with the Ore Export (OREX) Railway Line traversing the Beeshoek Mine.

The purpose of this report is to define the faunal ecology of the focus area as well as mapping and defining areas of increased Ecological Importance and Sensitivity (EIS) and to define the Present Ecological State (PES) of the focus area.

1.1 Project Description[1]

The purpose of the Beeshoek Mine project is to give effect to the Regulation 23 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) requirements for the optimisation of the Mining Right, as well as the implementation of the best practical environmental management measures for the operation and management of the Waste Rock Dumps (WRDs). Further to this, the proposed Beeshoek Low-Grade Beneficiation Optimisation Project is to allow Beeshoek Mine to optimise the mining process and reduce mineral waste on site (in line with the national waste management hierarchy), by implementing two additional beneficiation projects, namely a new WHIMS Plant to rework the existing slimes from the slime dam and a new Jig Plant to rework the existing low-grade stockpile (discard dump).

The above-mentioned Beeshoek Mine is split into five (5) projects (or listing activities). The five (5) projects are collectively referred to as the "**focus area**". See also Figures 1 - 4 for a

[1] Assmang (Pty) Ltd: Beeshoek Iron Ore Mine. FINAL Environmental Scoping Report in terms of National Environmental Management Act, 1998 and the National Environmental Management: Waste Act, 2008 for: Beeshoek Mine Optimisation Project. April 2021.
Report Reference - EnviroGistics Ref.: 21910. Departmental Ref.: 223MRC. Mining Right Ref: 223MRC
Report Author - Tanja Bekker. MSc. Environmental Management; Pr.Sci.Nat. EAPASA Reg No: 2019/306; SACNASP Reg No: 400198/09

depiction of the proposed five projects, with detailed descriptions of each provided in Part A, Section 1.1.

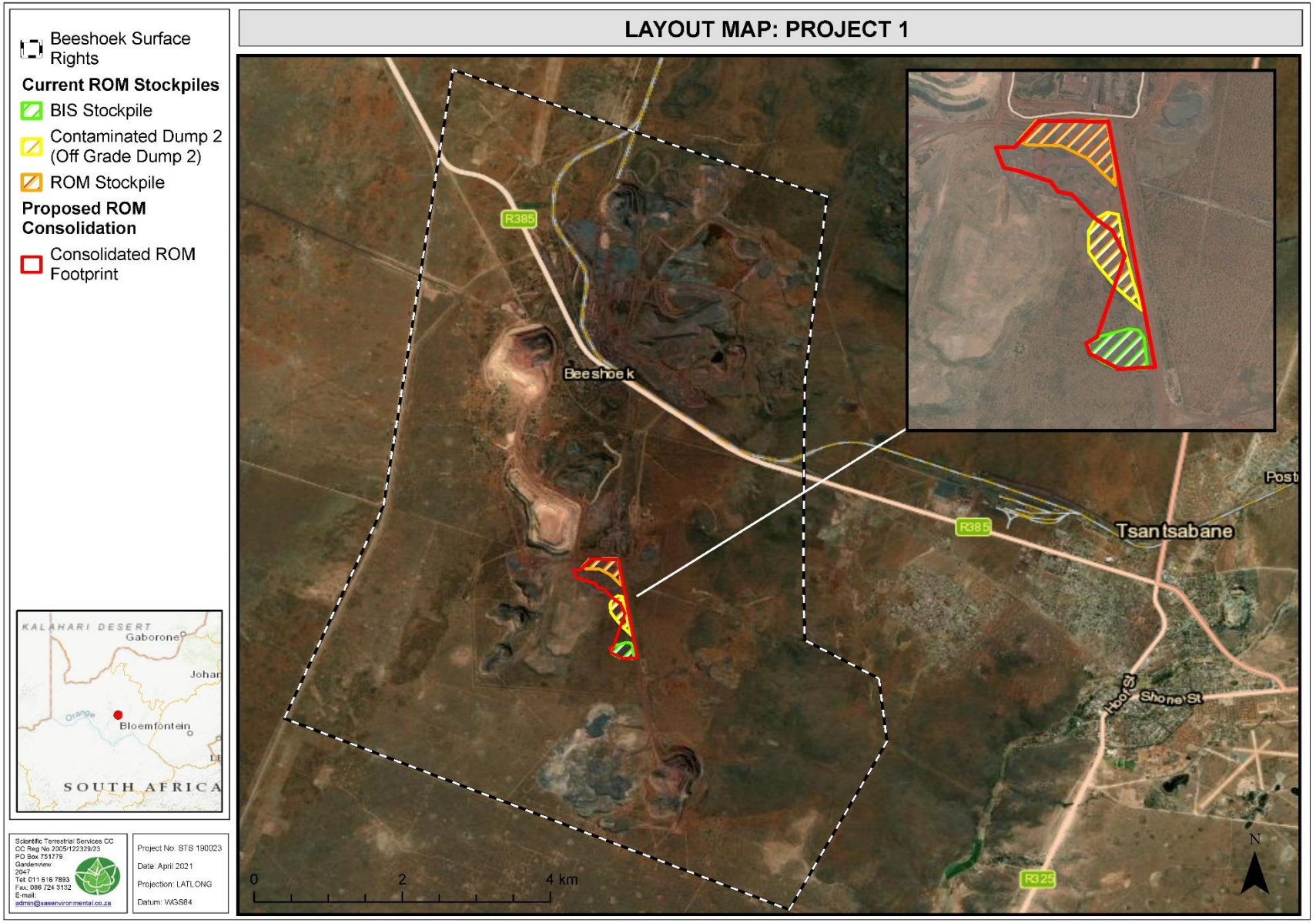


Figure 1: Layout map of Project 1 - Consolidation of Run of Mine (ROM) Stockpiles on South Mine.

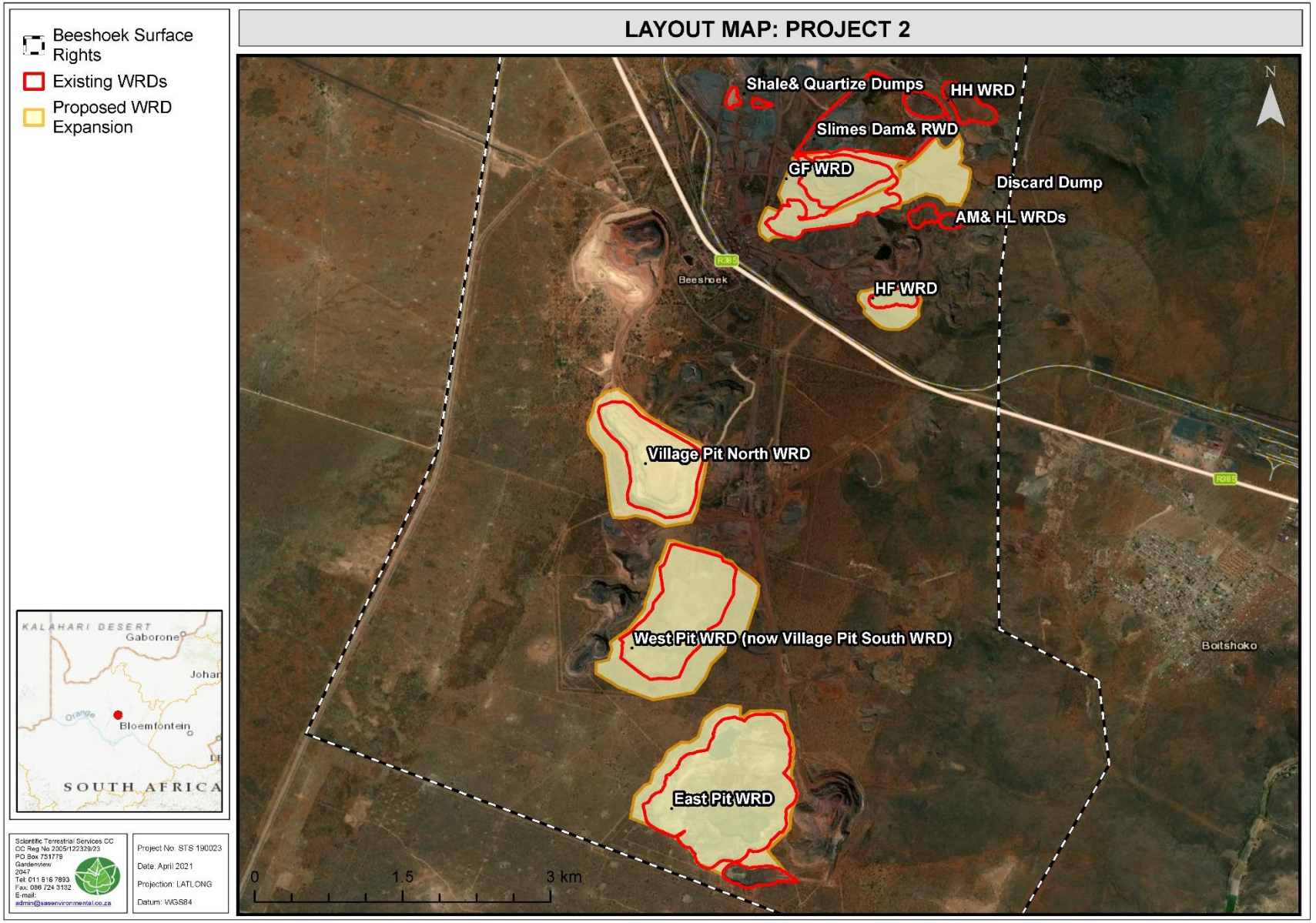


Figure 2: Layout map of Project 2 - Amendments to the design of existing Waste Rock Dumps (WRD) in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints.

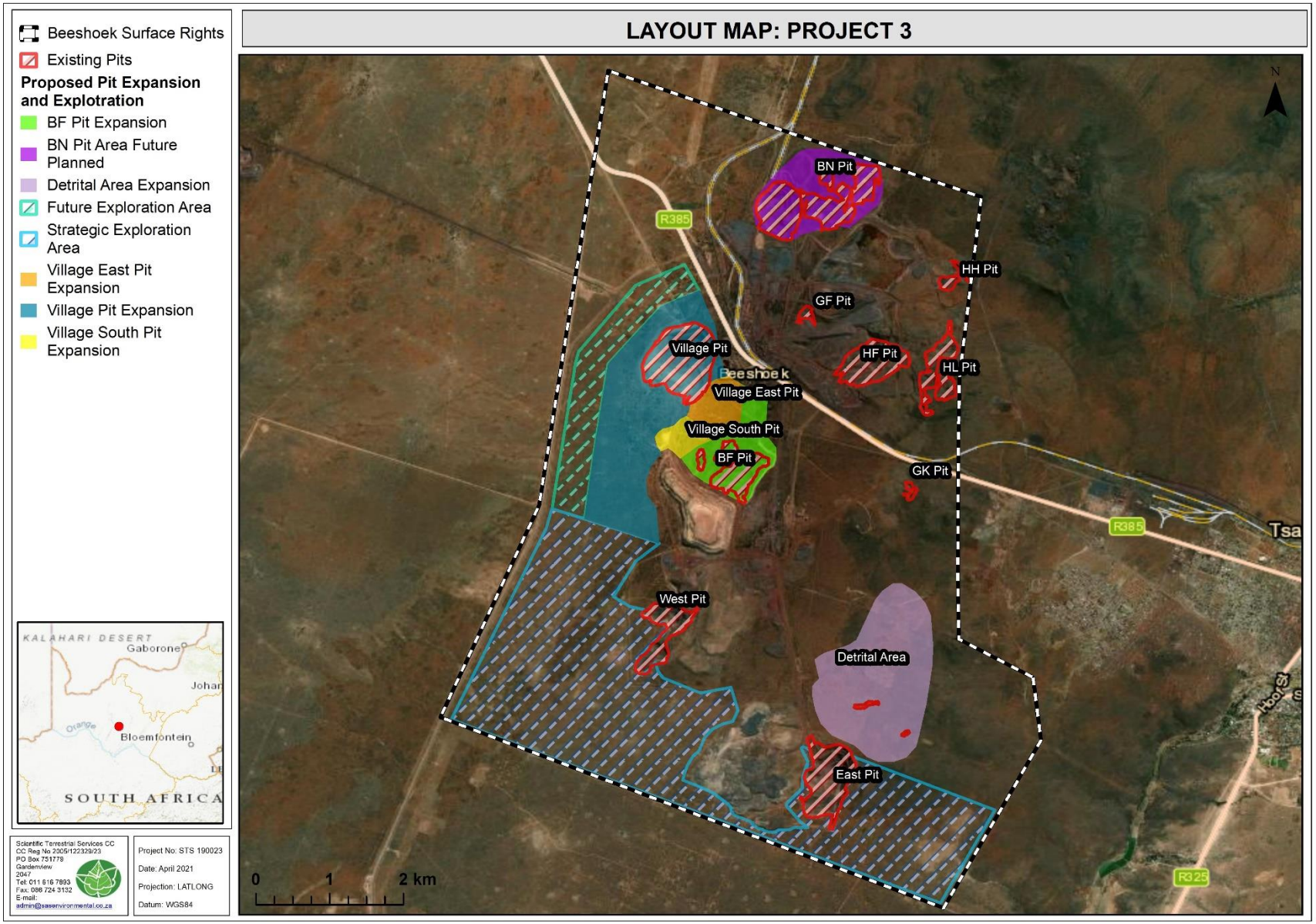


Figure 3: Layout map of Project 3 - Increase of opencast footprint areas, as well as the undertaking of detrital mining.

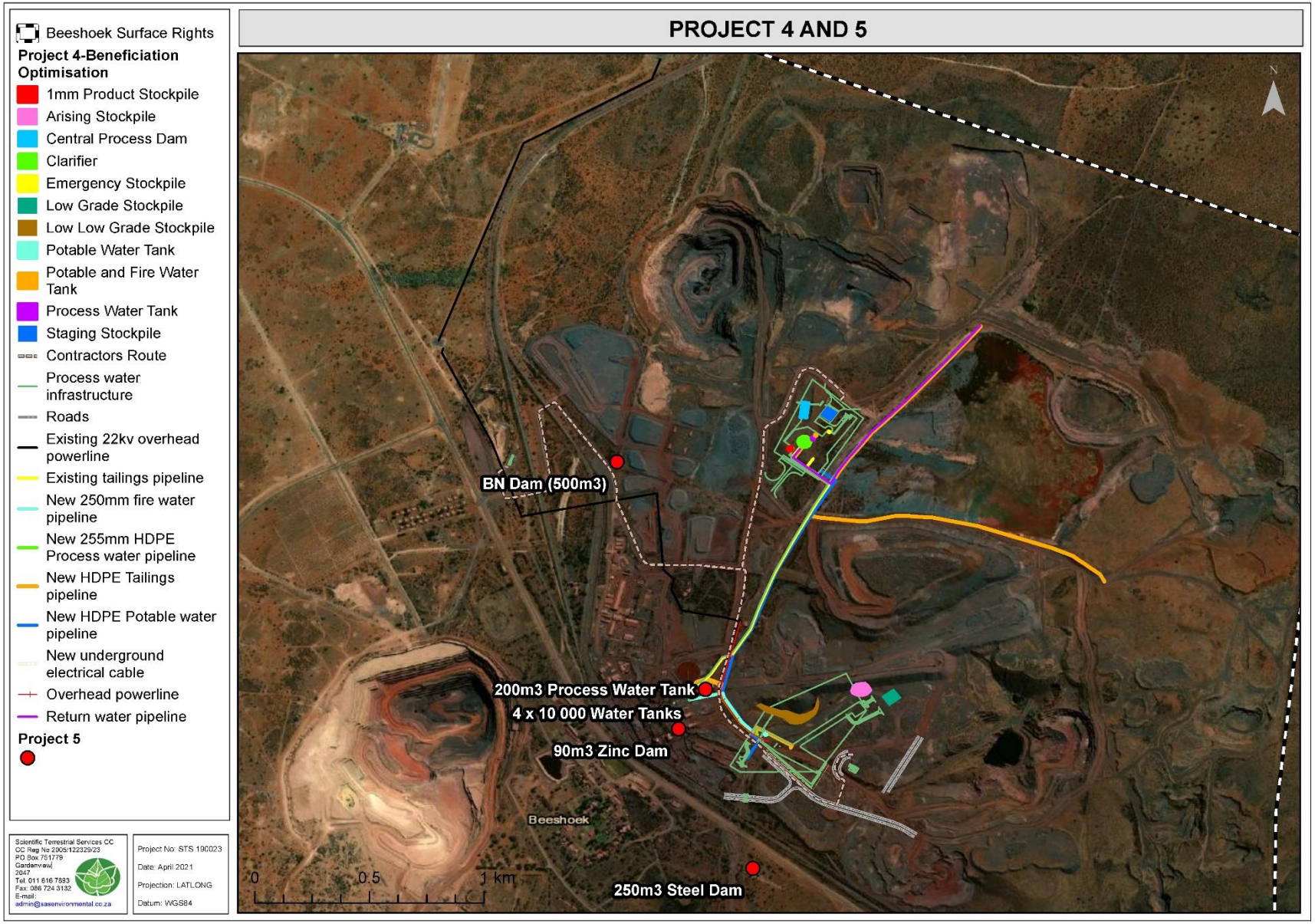


Figure 4: Layout map of Project 4 - Optimisation of beneficiation and implementation of the waste management hierarchy, as well as Project 5 - Water Management.

1.2 Scope of Work

The objective of this study:

- To provide inventories of faunal species or signs thereof as encountered within the focus area;
- To determine and describe habitat types, communities and the ecological state of the focus area and to rank each habitat type based on conservation importance and ecological sensitivity;
- To identify and consider all sensitive landscapes including rocky ridges, wetlands and/ or any other special features;
- To conduct a Red Data Listed (RDL) species assessment as well as an assessment of other Species of Conservation Concern (SCC), including potential for such species to occur within the focus area;
- To provide detailed information to guide the activities associated with the proposed development activities associated within the focus area; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements and the provision of ecological services in the local area.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The detailed faunal assessment was confined to the focus area, however the greater Beeshoek Mine SRA wherein the focus area is located (as per Figure 1 in Part A), was included in the desktop analysis. Please refer to the report Part A: Section 3 for all desktop results;
- Although habitat units and habitat utilisation have been described for the entire Beeshoek Mine SRA, areas outside of the assessed focus area (i.e., the footprint of the five proposed projects) were not assessed in detail during the site visit and data was thus extrapolated for these areas. If changes are made to the footprint areas, these would need to be ground-truthed;
- Three field assessments were undertaken across various seasons, namely 10-13 June 2019 (winter assessment), 22–24 January 2020 (summer assessment), and 1-5 March 2021 (early autumn) – although it must be noted that each assessment period focused on a different site and did not necessarily reconsider previously visited sites. A more comprehensive assessment would require that more than one assessment take place

for the entire focus area (revisits to the same locations) and that these assessments occur across all seasons of the year. To account for seasonal limitations and frequency of assessments, on-site data was augmented with all available desktop data, together with project experience in the area;

- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and considered and the information provided is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management;
- Due to the nature and habits of most faunal taxa, the high level of surrounding anthropogenic activities, it is unlikely that all species would have been observed during a field assessment of limited duration. Therefore, site observations were compared with literature studies where necessary; and
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the footprint area may therefore have been missed during the assessment.

2. ASSESSMENT APPROACH

To determine the faunal ecological status of the focus area, three field assessments were undertaken across various seasons, namely 10-13 June 2019 (winter assessment), 22–24 January 2020 (summer assessment), and 1-5 March 2021 (early autumn). A reconnaissance 'walkabout' was initially undertaken to determine the general habitat types found throughout the focus area, following this, specific study sites were selected that were representative of the habitats found within the focus area, with special emphasis being placed on areas that may potentially support faunal SCC. Sites were investigated on foot to identify the occurrence of fauna within the focus area. Sherman and camera traps were used to increase the likelihood of capturing and observing mammal species, notably nocturnal and reclusive mammals.

A detailed explanation of the method of assessment is provided in Appendix A of this report. The faunal categories covered in this assessment are mammals, avifauna, reptiles, amphibians, general invertebrates and arachnids. For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of Part A of the study.

2.1 General approach

In order to accurately determine the PES of the focus area and capture comprehensive data with respect to faunal taxa, the following methodology were applied:

- Maps and digital satellite images were consulted prior to the field assessment in order to determine broad habitats, vegetation types and potentially sensitive sites. An initial visual on-site assessment of the focus area was undertaken in order to confirm the assumptions made during consultation of the digital satellite imagery;
- A literature review with respect to habitats, vegetation types and species distribution was conducted;
- Relevant databases considered during the assessment of the focus area included the Important Bird and Biodiversity Areas (IBA, 2015), South African Bird Atlas Project 2 (SABAP2), Animal Demography Units (ADU) Virtual Museum, International Union for Conservation of Nature (IUCN), the Northern Cape Critical Biodiversity Area (CBA) Map (2016) and the National Biodiversity Assessment (NBA, 2018);
- Specific methodologies for the assessment, in terms of field work and data analysis of faunal ecological assemblages are presented in Appendix A of this report; and
- For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of Part A.

2.2 Sensitivity Mapping

All the ecological features associated with the focus area were considered, and sensitive areas were assessed. A Geographic Information System (GIS) was used to project these features onto satellite imagery and/or topographic maps. The sensitivity map should guide the final design and layout of the proposed development activities. Please refer to Section 4 of this report for further details.

3. FAUNAL ASSESSMENT RESULTS

3.1 Faunal Habitat

The SRA comprised of four (4) broad faunal habitat units, with each broad unit comprising smaller habitat units that support various faunal species, often some of which are niche and habitat restricted species. These habitat units are discussed briefly in terms of faunal utilisation and importance below. For a more detailed description and discussion of these habitat units see Section B (Floral Report) and refer to the freshwater ecological assessment undertaken by Scientific Aquatic Services (SAS).

The vegetation communities were grouped based on species compositions, but vegetation groupings also largely relied on the various soil forms found on site.

Natural Habitat Areas comprising:

- Calcrete Shrubland;
- Open Thornveld; and
- Rupicolous Habitat;

Modified Habitat Areas comprising:

- Degraded Thornveld Habitat; and
- Transformed Habitat;

Watercourse Habitat comprising:

- Cryptic Wetlands; and
- Episodic Drainage Lines.

Non-watercourse habitat comprising:

- Preferential Flow Paths;
- Recharge Zone; and
- Seasonal Depressions.

For a detailed discussion of the various faunal assemblages, habitat utilisation and conservation sensitivities associated with the above-mentioned habitat units, refer to Section 3.2 – 3.5. Figure 5 depicts the detailed extent of the habitat units within the Beeshoek Mine. Figure 6 - 8 include the proposed layout.

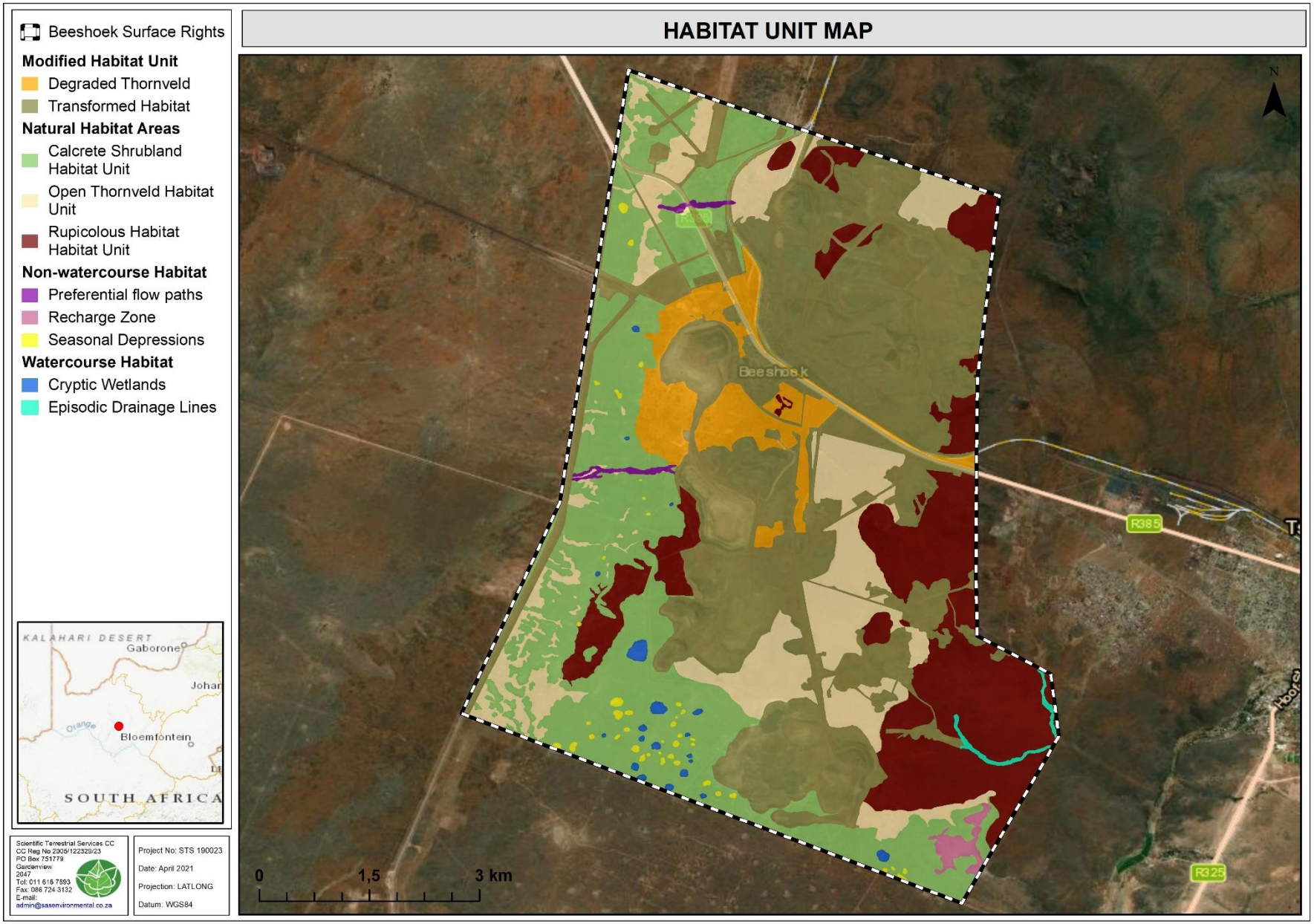


Figure 5: Habitat units encountered within the focus area.

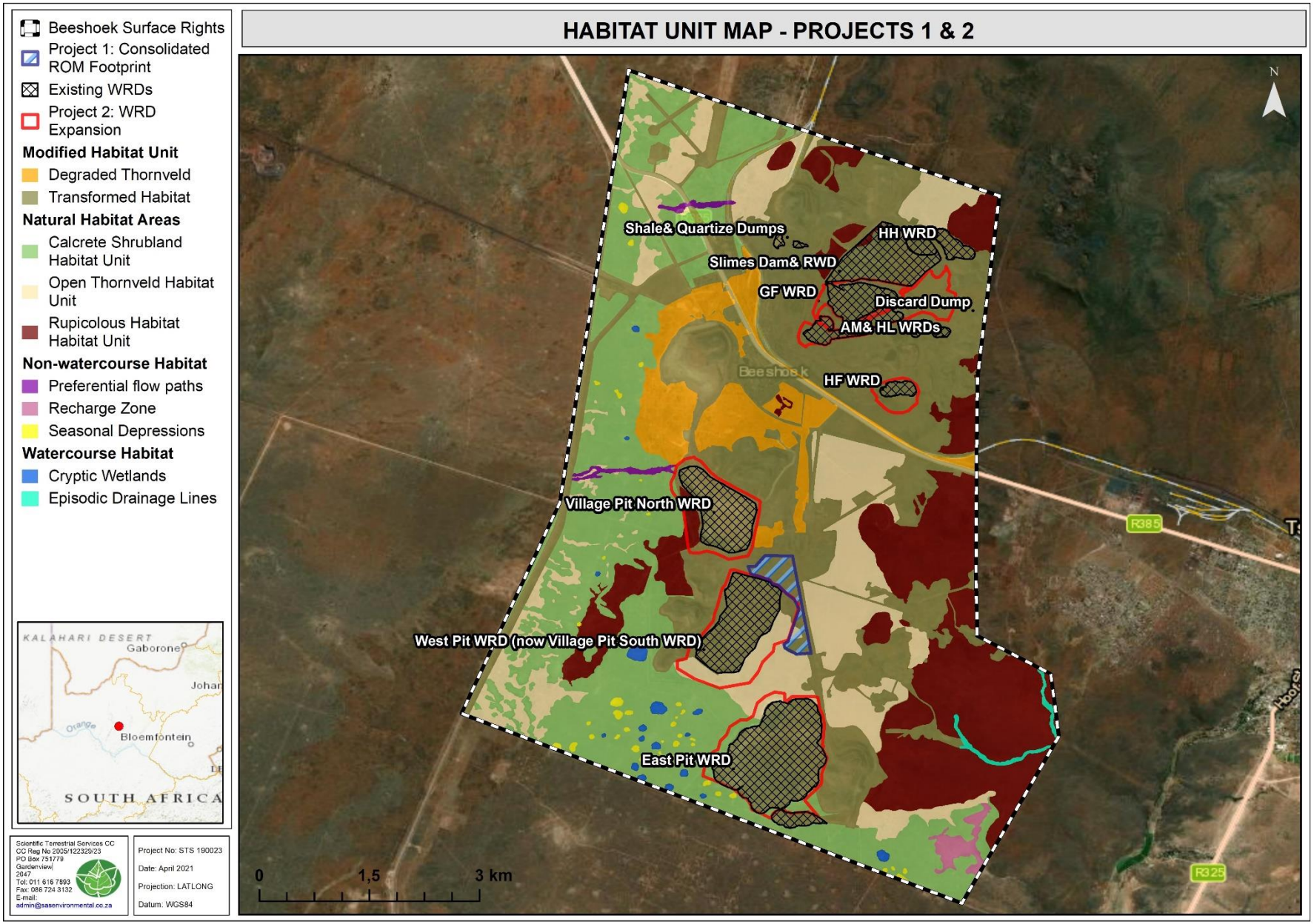


Figure 6: The proposed footprints of Project 1 and 2 superimposed onto the delineated habitat units.

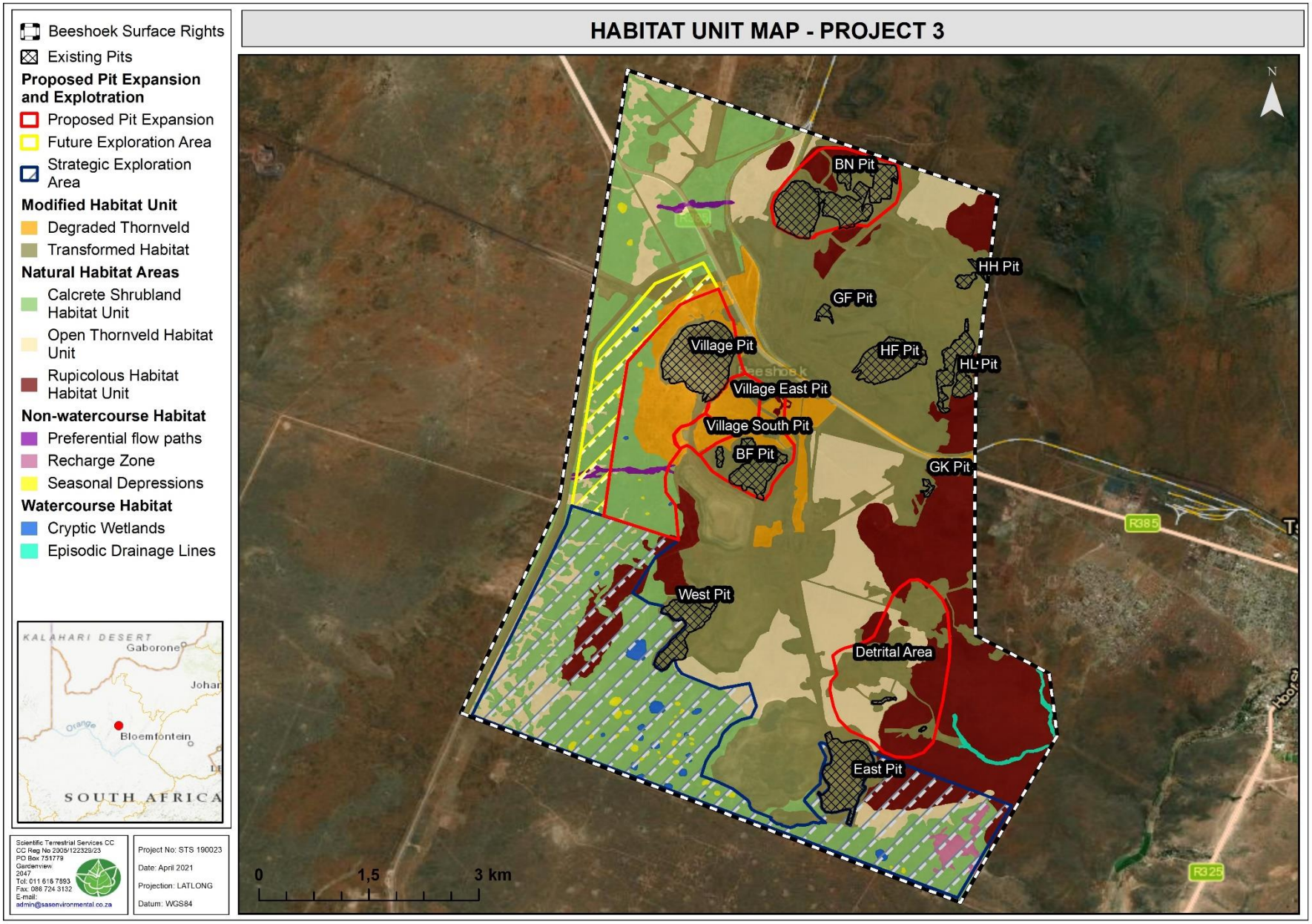


Figure 7: The proposed footprints of Project 3 superimposed onto the delineated habitat units.

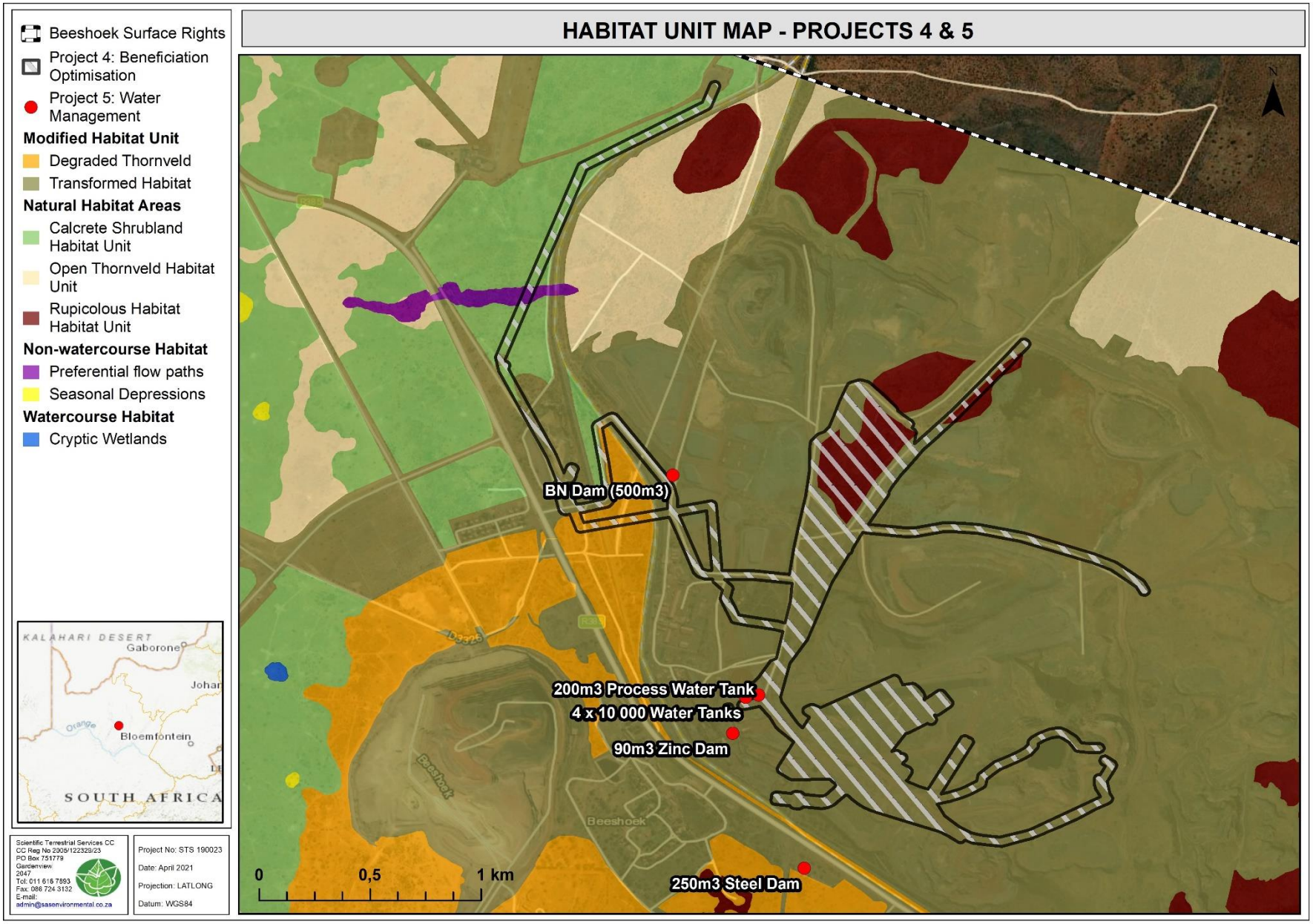


Figure 8: The proposed footprints of Project 4 and 5 superimposed onto the delineated habitat units.

3.2 Mammals

Table 1: Field assessment results pertaining to mammal species within the focus area.

Photograph Notes:	Mammal SCC			
Top: Left: *Geosciurus inauris* (Ground Squirrel). Right: *Cynictis penicillata* (Yellow Mongoose). **Middle:** Left: *Raphicerus campestris* (Steenbok). Right: *Canis mesomelas* (Black-backed Jackal) scat. **Bottom:** Left: *Tragelaphus strepsiceros* (Kudu). Right: *Hystrix africaeaustralis* (Porcupine).	**Species**	**Discussion**	**Threat Status**	**POC**
	Otocyon megalotis (Bat-eared Fox)	Although no records are available of this species being located within the focus area, the habitat in the natural areas surrounding the active mining sites may provide foraging grounds for this species, however breeding activity herein is unknown. Food resources appear to be abundant enough to support a pair of breeding individuals.	Protected - TOPS Specially Protected - NCNCA	M
	Orycteropus afer (Aardvark)	This species has been observed in the adjacent Doornfontein property during the 2019 assessment, and as such, may occur within the focus area. If present, this species will most likely occur outside of the fenced mining footprint where habitat availability and connectivity to the surrounding farms is more suitable.	Specially Protected - NCNCA	H
	Poecilogale albinucha (African Striped Weasel)	This species may occur throughout the focus area, not being limited to certain areas. This species is small enough to traverse all fences and will likely only avoid the active mining footprint.	Specially Protected - NCNCA	M
	Vulpus chama (Cape Fox)	This species has been observed in the adjacent farms and as such, may occur within the focus area. If present this species will most likely occur outside of the fenced mining footprint where habitat availability and connectivity to the surrounding farms is more suitable.	Specially Protected - NCNCA Protected - TOPS	M
	Ictonyx striatus (Striped Polecat)	This species may occur throughout the focus area, not being limited to certain areas. This species is small enough to traverse all fences and will likely only avoid the active mining footprint.	Specially Protected - NCNCA	M
	Felis nigripes (Black-footed Cat)	This species has been observed in the adjacent farms and as such, may occur within the focus area. If present this species will most likely occur outside of the fenced mining footprint where habitat availability and connectivity to the surrounding farms is more suitable.	VU Protected - TOPS Specially Protected - NCNCA	M

General Discussion

Mammal diversity within the focus area has been notably impacted upon by the current mining activities, adjacent cattle farming and the illegal snaring activities from the adjacent communities. Large mammals were largely absent from the focus area with the exception of *Tragelaphus strepsiceros* (Kudu) as this species is wide roaming, able to jump fences, appears adaptable to areas of increased anthropogenic activities and as a strict browser, able to utilise the browse available in the SRA. Medium size mammals such as *Phacochoerus africanus* (Warthog), *Raphicerus campestris* (Steenbok) and *Hystrix africaeaustralis* (Porcupine) were evidently the most active mammals in the focus area, with spoor, burrows and direct observations being made throughout. The mesopredators *Canis mesomelas* (Black-backed Jackal) is likely the dominant predator in the focus area, although likely to occur in low abundances, utilising not only the focus area but the surrounding natural areas as well. Small species such as *Geosciurus inauris* (Ground Squirrel), *Cynictis penicillata* (Yellow Mongoose), *Procavia capensis* (Rock Dassie), *Tatera leucogaster* (Bushveld Gerbil), *Micaelamys namaquensis* (Namaqua Rock Mouse), *Elephantulus* sp. (Elephant Shrew), *Saccostomus campestris* (Pouched Mouse), *Mastomys coucha* (Southern Multimammate Mouse) and *Gerbillurus paeba* (Hairy-footed Gerbil) will occur throughout the more intact areas of the focus area. Additionally, these small species form a base food resource for mesopredators, raptors as well as predatory snakes.

Although the focus area retains a natural setting around the current mining footprint, the large fence surrounding the SRA limits species movement, notably larger mammals, to and from this area and the surrounding areas. Smaller mammals can more easily move through this fence structure, with several diggings identified underneath the fence, and as such are less inhibited in terms of movement and habitat access. It is noted that the region has been experiencing a sustained and abnormal dry period, leading to decreased food resources within the focus area noted during the 2019 and 2020 surveys. Prior to the 2021 survey, the region received above average rainfall which resulted in an increased rate of recovery of the vegetation and an increase in available food resources, though there still remained a low diversity and abundance of mammal species at the time of the survey. With time and given the resurgence of vegetation (food resources), it is probable that mammal species abundance and diversity levels will begin to recover, however this is largely dependent on future good rains and habitat recovery. At present, the seasonal depressions and cryptic wetlands provide temporary sources of surface water, but also increased vegetation growth (food resource). This increase in vegetation and water naturally attracts herbivorous species to these localities, and likewise the mesopredators will follow. As such, the watercourse and non-watercourse habitats are of increased ecological importance in the greater landscape.

Conclusion

The screening tool did not associate any sensitive or important mammals with the focus area, however following the site assessment, it is considered likely that six SCC (as listed in this table) have a medium to high probability of utilising the focus area. The fenced active mining area is likely only used for foraging whilst the western and south-western portions of the focus area located outside the active mine fence may possibly be use for breeding and more permanent habitation.

Overall, the mammal abundance and diversity of the focus area was lower the expected, most likely attributable to the current and past land use activities, which has further been compounded by an extended dry period in which food resources declined and many mammal species either moved further out into the surrounding landscape in search of available resources or deceased. The planned mining activities will result in the loss of habitat and consequently a further decrease in species diversity and abundance within the local setting. Many of the mammal species will likely relocate into the surrounding natural habitats, whilst several of the smaller species may be able to continue inhabiting the areas amongst the mining footprints, albeit at lower abundance levels.

3.3 Avifauna

Table 2: Field assessment results pertaining to avifaunal species within the focus area.

Photograph Notes:	Mammal SCC			
Top: Left: *Philetairus socius* (Sociable Weaver). Right: Sociable Weavers nest. **Middle:** Left: *Mirafra fasciolata* (Fawn-coloured Lark). Right: *Mirafra sabota* (Sabota Lark). **Bottom:** Left: *Alopochen aegyptiacus* (Egyptian Goose). Right: *Anas capensis* (Cape Teal).	**Species**	**Discussion**	**Threat Status**	**POC**
	*Ardeotis kori* (Kori Bustard	This species was observed foraging within the southern portion of the focus area in the Calcrete Shrubland Habitat. It is likely that this species will make wide use of this habitat unit as well as the surrounding Open Thornveld Habitat. It is possible that this species may utilise the focus area for breeding, although no breeding pairs, only an individual was observed.	VU - TOPS	Confirmed
	Neotis ludwigii (Ludwig's Bustard)	This species has been recorded in the SABAP pentad 2820_2255 in 2017. This species will likely favour the Calcrete Shrubland and Thornveld Habitats within the focus area. Although not observed on site, this species distribution encompasses the focus area and given sufficient food resources, may inhabit the less impacted areas of the focus area.	VU – TOPS EN - IUCN Specially Protected - NCNCA	M
	Sagittarius serpentarius (Secretarybird)	This species will likely favour the Calcrete Shrubland and Thornveld Habitats within the focus area. Although not observed on site, this species distribution encompasses the focus area and, given sufficient food resources, may inhabit the less impacted areas of the focus area. Although there are currently no recordings of this species within the pentads associated with the focus area, the habitat is considered suitable, and it is possible that individuals may utilise the focus area for foraging.	EN - IUCN Specially Protected - NCNCA	M

General Discussion

Avifaunal species were well represented within the focus area, with species diversity being largely commensurate with observations as per the corresponding pentads on the South African Bird Atlas Project. The varying habitats within the focus area, spanning the Open and Encroached Thornveld, Rocky outcrops and Watercourse Habitats provided a good heterogenous vegetation structure that several avifauna can make use of. Species observed on site, not including the ones listed above, include: *Streptopelia capicola* (Cape turtledove), *Pycnonotus nigricans* (Red-eyed bulbul), *Laniarius astrococcineus* (Crimson-breasted shrike), *Prinia masulosa* (Karoo prinia), *Sylvietta rufescens* (Long-billed crombec), *Ardeotis kori* (Kori Bustard, VU), *Pterocles Namaqua* (Namaqua Sandgrouse), *Rhinoptilus africanus* (Double-banded Courser) and *Afrotis afraoides* (Northern Black Korhaan). Ground dwelling birds (bustards, korhaans, larks and coursers) all appeared to favour the more open habitat areas whilst the dense thornveld areas and rocky outcrops were predominantly inhabited by smaller species that select for these areas. Waterfowl and bird's dependant on water were restricted to the cryptic wetlands and seasonal depressions that contained water post heavy rainfall. These habitats provide temporary high forage resources for wading and other birds following periods of high rainfall.

Overall, large areas of the focus area have been impacted upon as a result of mining activities and prospecting. This has resulted in fragmentation of the available habitats and a potential discontinuity in flight paths, notably for smaller birds. The focus area is considered to have an intermediate amount of forage for avian species due to the impacts mining as well as the general arid nature of the environment, notably for granivorous species. During the summer months the overall food resource production of the herbaceous layer does increase, especially for granivorous species, and a higher abundance of avifauna can be supported. Additionally, the summer months will see an increase in insect abundance which provides an energy rich source of food for many avifaunal species. This increase is likely mimicked by an increase in small mammals as well as lizards and skinks which are an important food resource for raptors and some smaller bird species.

Conclusion

Although a large contingent of common avifaunal species assemblage was observed, only three SCC have a high probability of utilising the focus area. Two of these SCC may utilise the focus area for breeding, namely: *Ardeotis kori* (Kori Bustard) and *Neotis ludwigii* (Ludwig's Bustard). Overall, species abundance levels will vary within the focus area in accordance with rainfall and seasonal changes and their effect on available food resources, with some avifaunal species migrating north during the winter months.

Clearing of vegetation for the proposed mine expansion will have a direct impact on habitat availability within the focus area, leading to localised migration of many avifaunal species to adjacent habitats outside that of the proposed mining footprints as well as to areas outside of the focus area. Species that relocate into the surrounding areas will be subject to higher levels of competition for food resources and space which may lead to further species displacement and potentially, species loss. Some more adaptable species will likely continue to occur within the active mining footprints, utilising the modified areas in conjunction with the small patches of habitat that are likely to remain between the various mining footprints.

3.4 Herpetofauna

Table 3: Field assessment results pertaining to amphibian species within the focus area.

Photograph Notes:	Discussion
Top: Left: *Pedioplanis lineoocellata* (Spotted Sand Lizard). Right: *Trachylepis spilogaster* (Kalahari Tree Skink). **Middle:** Left: *Kassina senegalensis* (Bubbling Kassina) tadpole). Right: *Kassina senegalensis* (Bubbling Kassina) metamorphosising to the adult stage. **Bottom:** Left: *Stigmochelys pardalis* (Leopard Tortoise). Right: Cryptic Wetland. 	No Amphibian or Reptile SCC were observed within the focus area during the assessments. Further, consultation of the various databases such as the Animal Demography Units Virtual Museum and iNaturalist also indicated no previous records of any herpetofauna SCC. The arid nature of the focus area naturally limits amphibian diversity, yet it will be favoured by reptiles who are generally physiologically well adapted for such climates. The cryptic wetlands and depressions that do occur within the focus area will only be filled temporarily for a short period of time during times of high rainfall and present ideal localities for amphibians to breed within. Overall amphibian diversity, conferred with the online databases indicates a low expected species composition, with only less water dependant species such as *Kassina senegalensis* (Bubbling Kassina) (observed), *Vandijkophrynus gariepensis* (Karoo Toad), *Sclerophrys poweri* (Power's Toad), *Tomopterna cryptotis* (Tremelo Sand Frog) and *Breviceps adspersus* (Bushveld Rain Frog) expected to occur within the focus area. Food resources around the wetlands and depressions is likely to be sufficient for amphibian species due to the increased abundance of insect species surrounding these localities, however this will be temporary and seasonal, with the remaining periods of the year noting a decrease in food resources. During this time, it is likely that most amphibian species will go into a state of aestivation or limited activity, either burrowing down into the ground or seeking shelter under larger logs or rocks in the vicinity of these temporary water bodies. Several reptile species were observed during the field assessments, ranging from the small skinks, to larger predaotry snakes and tortoises. *Nucras intertexta* (Spotted Sandveld Lizard) and *Pedioplanis lineoocellata lineoocellata* (Spotted Sand Lizard) were observed on many ocasions, whilst *Agama aculeata aculeata* (Common Ground Agama) appeared to be less abundant. A single *Bitis arietans arietans* (Puff Adder) was observed on site during the 2021 assessment. It is important to remember that reptiles are inherently secretive and shy, making their detection and identification in the field challenging. As such, based on the available databases, habitat availability and the databses, the focus area is likely to have a moderate diversity of common reptile species which are well represented in the region. Reptile species are likely to make use of all habitat units, with many of the skinks being closely associated with the areas of infrastructure as they appear to be highly adaptable to modified environments. Food reources for reptiles will follow a cyclical nature, with prey species (invertebrates and small mammals) numbers being determined by seasons and similarly, the vegetation growth/decline accompanying such changes.
	Conclusion
	Reptiles are well adapted to surviving in arid areas and as such, are often some of the only species inhabiting these areas. Likewise, reptiles can adapt to modified environments more readily than other species, provided there are suitable food resources available. Conversely, amphibian species are not well suited to such environments and often are some of the first species to decline in changing environments (through loss of water resources as well as changes to water quality). Many of the reptiles will be able to self-relocate ahead of mining expansion activities, however amphibian species cannot do so as readily, notably those that are more dependent on being located nearby to areas of increased moisture. Mining expansion and the loss of the depressions and cryptic wetlands will have a significant impact on amphibian species, likely leading to the loss individuals in the focus area who rely on these habitats. Reptile species will likely be able to exist within or adjacent to these areas (albeit at lower abundances) or relocate to the surrounding natural areas ahead of the mine expansion.

3.5 Invertebrates

Table 4: Field assessment results pertaining to invertebrate species within the focus area.

Photograph Notes:	**Mammal SCC**			
Top: Left: *Acanthoplus discoidalis* (Brown Armoured Corncricket). Right: *Anacridium moestum* (Tree Locust). **Middle:** Left: *Uroplectes carinatus* (Common Lesser-thicktail). Right: *Africallagma glaucum* (Swamp Bluet). **Bottom:** Left: Possible *Pterinochilus* sp burrow (Golden-brown Baboon Spider). Right: *Parabuthus granulatus* (Rough Thicktail).	**Species**	**Discussion**	**Threat Status**	**POC**
	*Pterinochilus* spp Potential burrow: 28°20'21.80"S 22°59'35.92"E	A potential burrow of the species was observed adjacent to the waste rock dump in the southern western of the focus area. Species of this genus dig vertical burrows in sandy soil where the either lay in wait for prey species or come out at night and hunt.	Specially Protected – NCNCA	H
	Ceratogyrus spp and *Harpactira* spp	Although there are no records of species from either genus occurring within the focus are or surrounds, there remains a possibility that individuals may still inhabit the focus area, predominantly in the western and south western portions of the focus area, outside of the direct mining footprint.	Specially Protected – NCNCA Protected - TOPS	L
	Hadogenes spp and *Opisthacanthus* spp	Although there are no records of species from either genus occurring within the focus are or surrounds, there remains a possibility that individuals may still inhabit the focus area, predominantly in the western and south western portions of the focus area, outside of the direct mining footprint.	Protected – NCNCA Protected - TOPS	L
	Opistopthalmus spp	Species from this genus have been recorded in the region of Postmasburg. Similar habitat presents within the focus area and as such there is an increased likelihood that species from this genre may occur within the focus area.	Protected – NCNCA Protected - TOPS	M
	Photographs: Image left illustrates rocky habitat under a *Bosica* sp favoured by many protected scorpions and potential baboon spiders. Image right illustrates the open sandy area where the baboon spider burrow was observed.	 		

General Discussion

Although the focus area is located in the more arid, western portion of South Africa, a relatively high abundance of invertebrates were observed. Insect species of the Orders Coleoptera, Orthoptera and Lepidoptera were dominant throughout, however the diversity within these orders was not high. This may be as a result of the extended dry period through which the more sensitive / niche insect species did not survive, as well as the fact that the arid landscape perpetuates the accordance of only the hardier and often more generalist species. Generalist species observed have the ability to utilise various plants as food resources, an important adaptation for arid environment survival. Insects are generally the most abundant macro-organisms within landscapes and often perform services vitally important for ecosystem functioning. Therefore, high insect abundance and diversity can indicate a healthy landscape. Insects serve as pollinators, remove detritus material, bury dung and associated parasites below the surface helping to cycle nutrients back into the soil while decreasing the parasitic load within an environment, reducing the risk of disease. Additionally, insects serve as a food resource for various fauna within the focus area, and as such an increased insect diversity and abundance within the focus area buffers forage sustainability for other faunal species as well as helps to maintain ecosystem functioning.

Several Nymphalidae (Monarch butterflies) and Lycaenidae (Coppers and Blues), which are all protected within the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) are known to occur within the area. The habitat integrity of the focus area for insects is considered moderately high. Although habitat transformation has occurred within the focus area the remaining habitats are largely still inhabitable for insects with food resources varying for different insect orders in accordance to the vegetation and season.

Arachnid species are notoriously hard to detect over a relatively short period of time, which can often lead to the under estimation of diversity and abundance. Taking this into consideration, habitat conditions for arachnids as well as available resources were analysed, whilst additional information on arachnid occurrences and species diversity for the QDS was collected from databases such as iNaturalist and the Animal Demography Unit (ADU). Several funnel-webs, spiders and scorpions were observed during the site assessment. The general habitat supplemented with the observations recorded on the site suggest that the focus area is likely to be inhabited by an abundance of scorpion and spider species, albeit by the more common species who are well adapted to arid environments as well as tolerant to increased ground vibrations as a result of mining activities. The varying landscape of the focus area, with rocky outcrops and lowland thornveld areas of varying density provide habitat for an increased breadth of arachnid species. Many arachnid species only venture out during the safety of night when they can avoid desiccation from the sun, opting to seek refuge under rocks, bark and dead trees during the day. Arachnid species are predatory, preying predominantly on invertebrates and in some instance small reptiles and rodents. Although the focus area was abundant in insect species, many of these were flying and largely arboreal species, limiting actual food availability to ground dwelling arachnids such as scorpions. Further, such food resources are cyclical in nature, commensurate with the seasons, which will, to a degree, inhibit arachnid populations in the focus area. Arachnids observed, apart from those listed above, include Family Agelenidae (Funnel Weaving Spiders), *Argiope australis* (Common Garden Orbweb Spider) and Genus *Thanatus* (Spider).

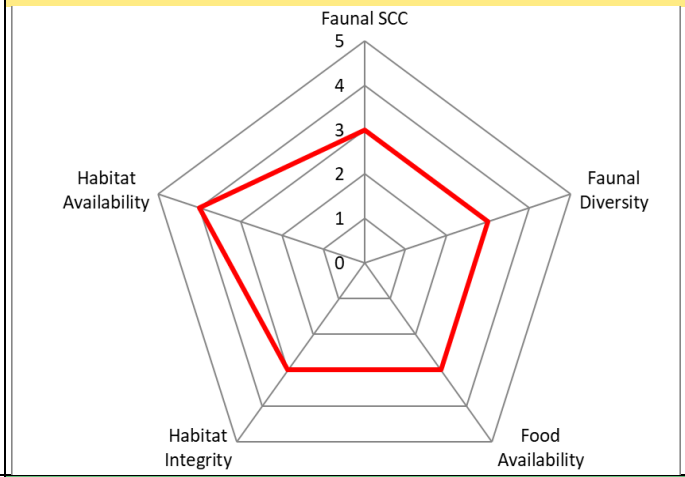
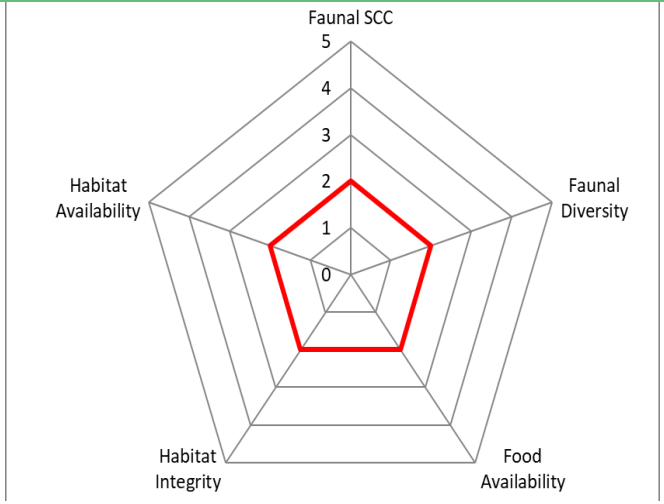
Conclusion

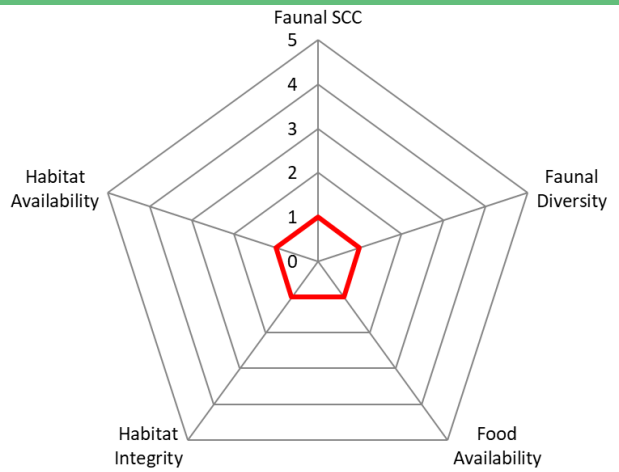
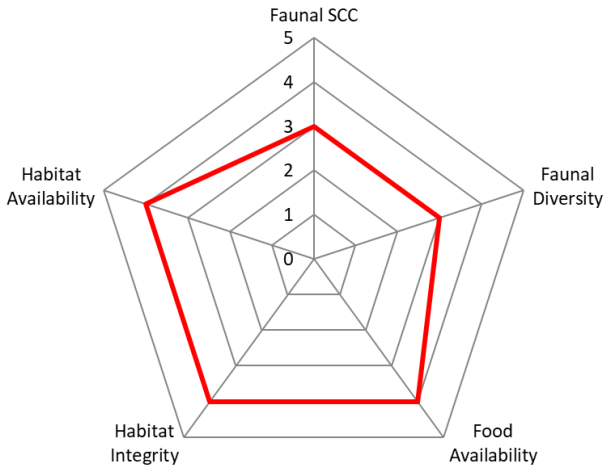
The focus area, with varying landscapes and potential areas of habitat will likely support an abundance of invertebrate species, however, due to the arid nature of the region, the diversity thereof will be limited to species that are well adapted to such conditions. Due to the extended dry period experienced up until late 2020, invertebrate assemblages, although well represented for the region, likely still have to fully recover. The proposed mine expansion activities will impact invertebrates as a result of extensive habitat loss, particularly the niche depressions and cryptic wetlands. Expanding mining activities will further lead to increased vibration disturbances in areas that currently do not experience such, which may be unfavourable to ground dwelling arachnids who rely on subtle vibrations to detect prey. Such hinderances to hunting may result in these species relocating to more suitable areas further away, decreasing species abundances and diversity in the focus area. Additionally, night-time lights from operations are likely to attract insects to the operations area, leading to potential increase in mortality rates as well as disruption of night-time navigation for insects that utilise the moon and / or stars as navigation tools as the lights out shine or mimic the moon and starlight.

4. SENSITIVITY MAPPING

Figures 9 to 12 below conceptually illustrates the faunal ecological sensitivity for the various areas. The areas are depicted according to their sensitivity in terms of the presence or potential for faunal SCC, habitat integrity, levels of disturbance and overall levels of diversity. Table 5 below presents the sensitivity of each habitat along with an associated conservation objective and habitat characteristics.

Table 5: A summary of the sensitivity of each habitat unit and implications for the proposed activities.

Habitat Unit	Habitat Sensitivity	Conservation Objective	Key Habitat Characteristics
Natural Habitat Areas -Calcrete Shrubland -Open Thornveld -Rupicolous Habitat	Intermediate 	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	- Screening tool indicates that *Neotis ludwigii* (Ludwig's Bustard) and *Sagittarius serpentarius* (Secretarybird) may occur in these habitats; - *Ardeotis kori* (Kori Bustard) was observed in the Calcrete Shrubland Habitat in the south of the focus aera; - These habitats encompass a large portion of the focus area, where the majority of faunal sightings were made. The varying vegetation structure and plant species provide differing degrees of cover and food resources for faunal species; and - Expansion into these habitat units will result in large scale habitat loss in the focus area as well displacement and potential increased mortalities of faunal species.
Modified Habitat -Degraded Habitat	Moderately Low 	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	- No threatened species are expected within this habitat unit; - This habitat unit has been notably disturbed due to the existing adjacent mining activities, limiting habitat availability and resources to faunal species; and - Development within these areas will result in vegetation clearance however is not expected to result in notable faunal species displacement.

Habitat Unit	Habitat Sensitivity	Conservation Objective	Key Habitat Characteristics
Modified Habitat -Transformed Habitat	Low 	Optimise development potential.	- This habitat encompasses the already existing mining footprint and all areas of disturbance were no natural vegetation remains; and - Expansion into this habitat will have very limited impacts to faunal species.
Non-watercourse Habitat -Preferential Water Flow Paths -Recharge Zone -Seasonal Depressions **Watercourse Habitat** -Cryptic Wetlands -Episodic Drainage Lines	Moderately High 	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	- These habitat units provide niche areas of habitation to specialised faunal species that often cannot survive in other areas of the focus area; - Amphibian species observed require these habitats for breeding and to a large degree foraging, whilst they can burrow into the softer soils during times of decreased or no rainfall, emerging when the seasons change and sufficient rains are once again received; - Many species associated within these habitats will not be able to readily relocate to other areas of suitable habitat and will likely die if mining extends into these areas; and - The pans and wetlands in times of increased rainfall provide a necessary and important source of water for fauna within the focus area, whilst increased vegetation growth in these areas are an important food resource.

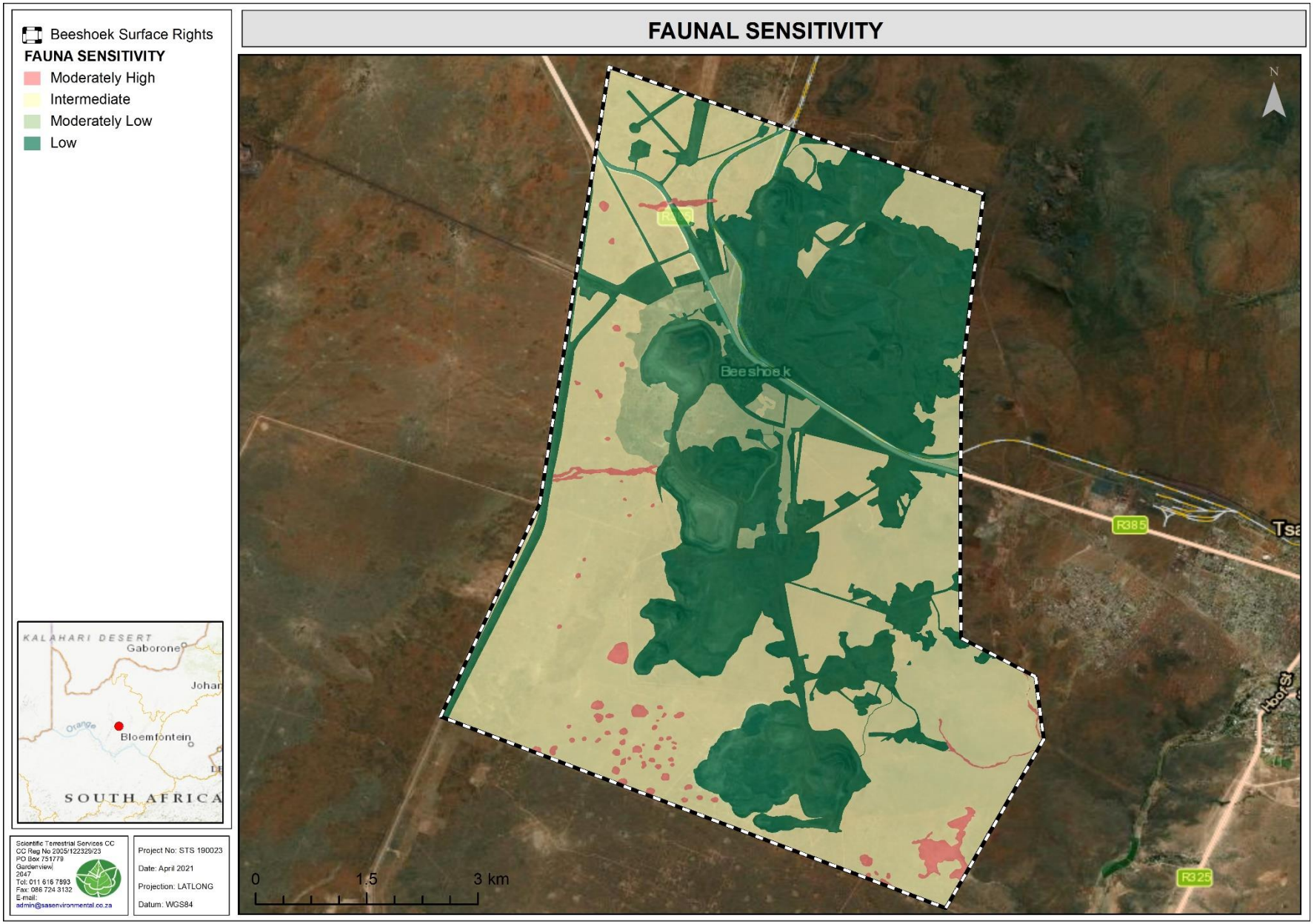


Figure 9: Sensitivity map for the Beeshoek Mine.

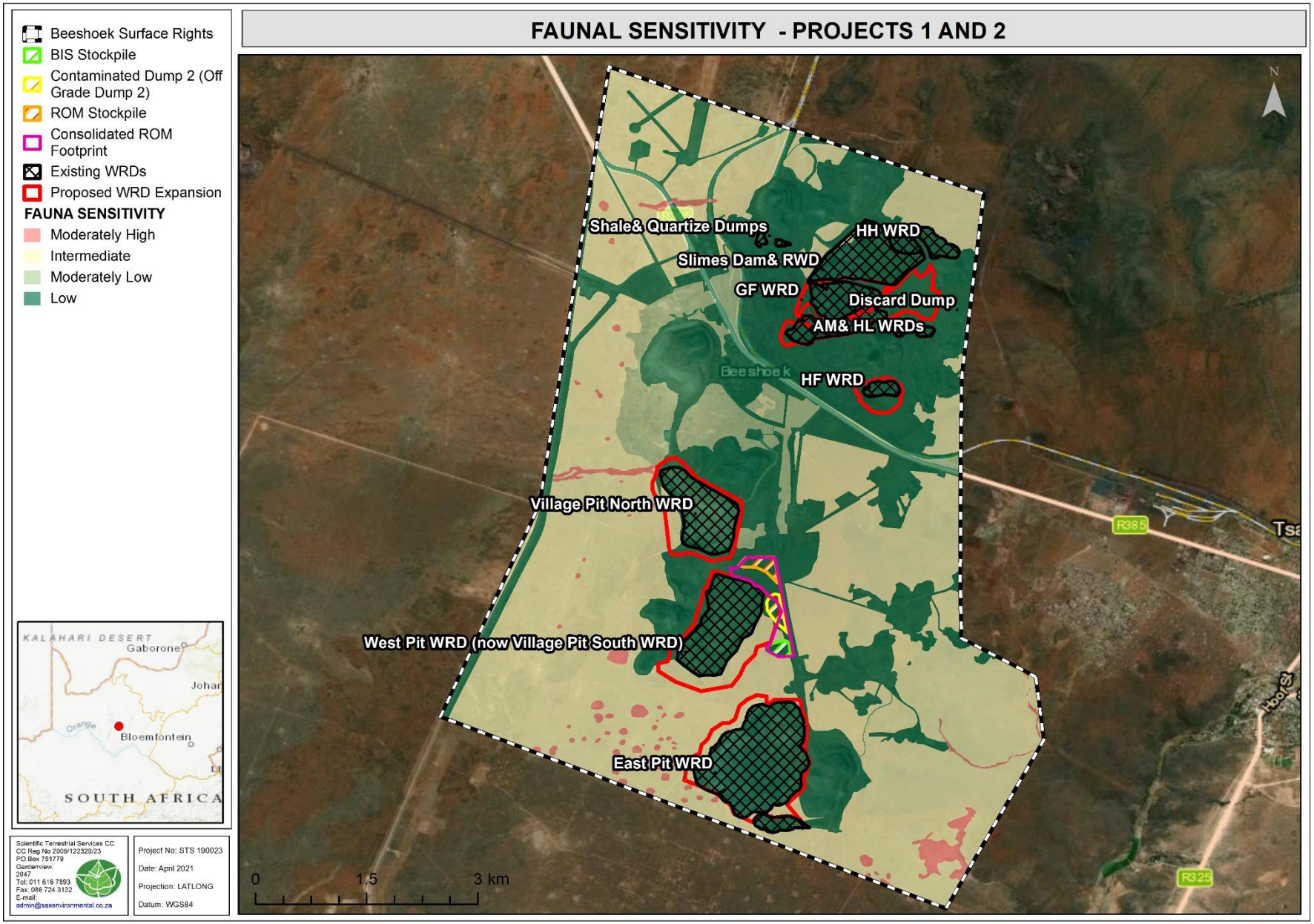


Figure 10: Sensitivity map for the Beeshoek Mine with the proposed Projects 1 and 2 superimposed on the habitat sensitivities.

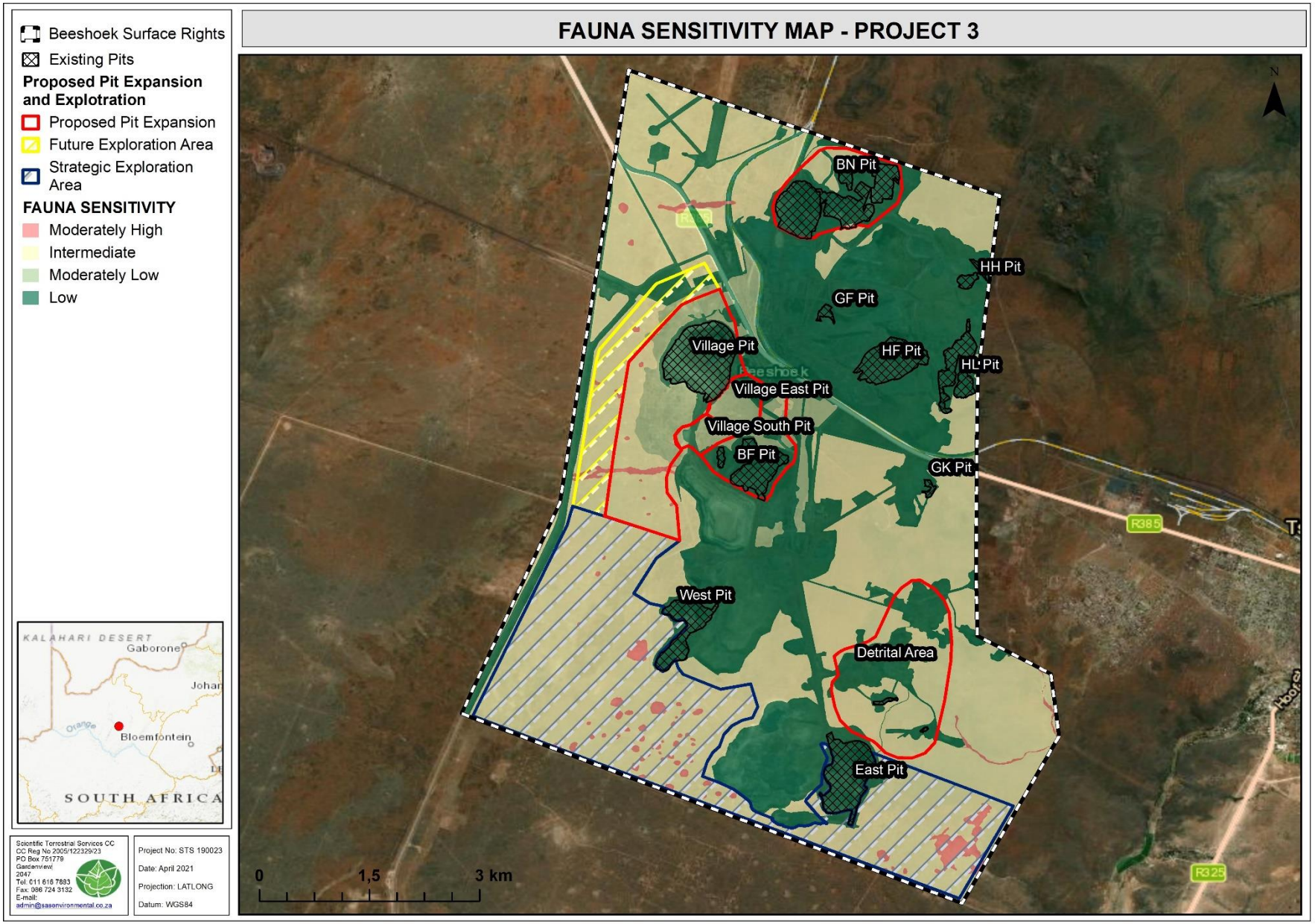


Figure 11: Sensitivity map for the Beeshoek Mine with the proposed Project 3 superimposed on the habitat sensitivities.

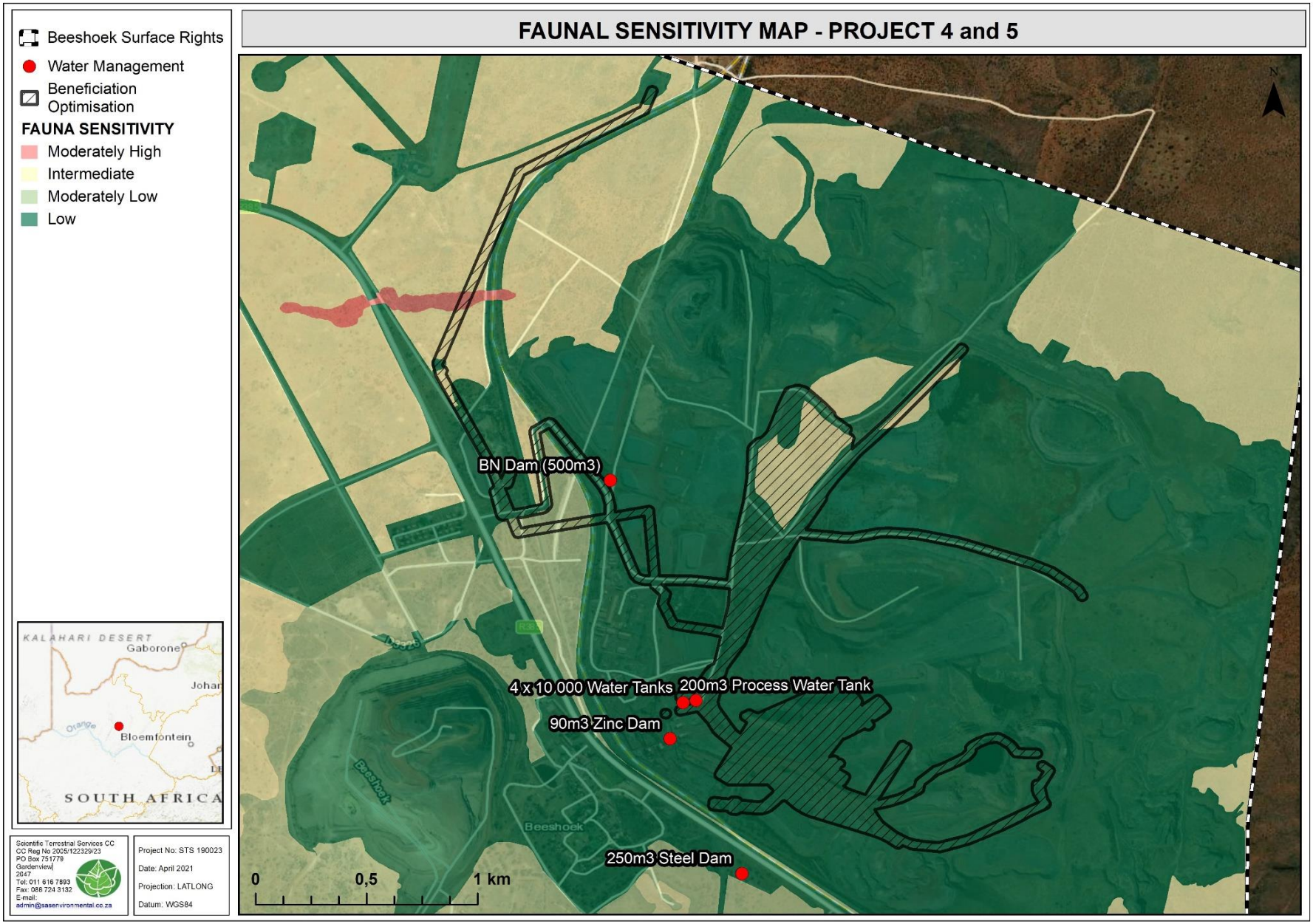


Figure 12: Sensitivity map for the Beeshoek Mine with the proposed Projects 4 and 5 superimposed on the habitat sensitivities.

5. IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed development for the focus area.

An impact discussion and assessment of all potential pre-construction, construction and operational and closure / decommissioning phase impacts are provided in Section 5.2 and 5.3. All mitigatory measures required to minimise the perceived impacts are presented in Section 5.4.

The impacts have been assessed accordingly to the various proposed projects and the habitat units which they will impact. Where logical, habitat units have been grouped together in terms of sensitivity and assessed as one. The assessed projects include:

Project 1 & 2 – Consolidation of the ROM Stockpiles on South Mine and amendments to the existing WRD designs and extension of the footprints;
Project 3 – Increase of the opencast footprints and undertaking of detrital mining; and
Project 4 & 5 – Beneficiation Project and Water Management project.

5.1 Activities and Aspect Register

Table 6: Aspects and activities register considering faunal ecology during the pre-construction and planning phases.

ACTIVITIES AND ASPECTS REGISTER
Planning Phase

- Potential failure to implement the required mitigation measures before and at the commencement of construction activities:
  • Potential failure to have a Rehabilitation Plan developed, and implemented, before the commencement of the project activities; and
  • Potential failure to implement an Alien and Invasive Plant (AIP) Management/Control Plan before construction activities commence.
- **Impact**: Long-term or permanent degradation and modification of the receiving environment, potential loss of SCC and fauna habitat.

- Potential poorly planned placement of the proposed infrastructure encroaching into areas of increased sensitivity which carry out important ecological functions. - **Impact**: Extensive and unnecessary loss of important faunal habitat, leading to a decline in faunal diversity, including a decline in potential faunal SCC numbers and diversity.

- Potential failure to implement the required mitigation measures before and at the commencement of construction activities:
  • Potential failure to conduct a site-specific survey to determine the presence of SCC; and
  • Potential failure to obtain the necessary permits for the removal of protected faunal species should they be needed resulting in delays to the construction activities.
- **Impact**: Long-term or permanent degradation and modification of the receiving environment and displacement or loss of faunal SCC.

Table 7: Aspects and activities register considering faunal ecology during the construction and operational phases.

Construction an Operation Phase
- Potential inadequate layout optimisation, resulting in extensive site clearing and the removal of indigenous vegetation. - **Impact:** Loss of important faunal habitat, species and the potential loss of faunal SCC.
- Uncontrolled and unplanned site clearing and the removal of vegetation and destruction of faunal habitat. - **Impact:** Loss of sensitive faunal habitat and faunal species reliant on this specific habitat for survival.
- Potential impaired water quality and altered flow / recharge of watercourses. - **Impact:** Loss of ecologically important faunal habitat and consequently a further loss of diversity and species reliant on the Wetland Habitats and the depressions. Contaminated soils lead to a loss of viable growing conditions for plants and results in a decrease of faunal habitat, diversity and SCC – rehabilitation effort will also be increased as a result.
- Proliferation of AIP species that colonise areas of increased disturbances and may outcompete indigenous plant species, including further transformation of adjacent, undeveloped habitat. - **Impact:** Degradation of favourable faunal habitat outside of the direct construction and operational footprint, leading to a decrease in faunal diversity at a local scale and loss of land to meet biodiversity targets.
- Potential failure to incorrectly stockpile topsoil removed during construction and mining activities leading to: • Potential contamination of topsoil stockpiles with AIP propagules; • Compaction of stockpiled topsoil leading to loss of viable soils for rehabilitation; and • Inefficient vegetating of stockpiled topsoil resulting in loss and degradation of soils. - **Impact:** Loss of viable soils for rehabilitation, thus hampering the potential for faunal species to successfully recolonize during rehabilitation activities. Ultimately a loss of faunal diversity will result.
- Potential dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs. - **Impact:** Loss of faunal habitat, diversity and SCC.
- Potential that the edge effects of the proposed mining activities are poorly managed. - Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to a continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the faunal habitat. - Potential AIP proliferation not the planned open space areas, which deteriorates the habitat, making it unsuitable for faunal assemblages. - **Impact:** Loss of faunal habitat, diversity and SCC within the direct areas of the proposed development. Loss of surrounding faunal diversity and faunal SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.
- Potential failure to implement a concurrent rehabilitation and an alien floral control plan. - **Impact:** Potentially leading to permanent transformation of faunal habitat and long-term degradation of important faunal habitat within the region, i.e. faunal communities associated with Watercourse Habitat unit.
- Habitat fragmentation resulting from poorly rehabilitated areas and inadequate planning for migratory corridors following the proposed activities. - **Impact:** Long-term changes in faunal habitat, reduced faunal movement and potential loss of SCC.
- Additional pressure on faunal habitat as a result of an increased human presence associated with the proposed development, contributing to: • Potential hunting/trapping/removal/collection of faunal species or potential SCC; and • Increased human activity will lead to the displacement and/or loss of potential faunal SCC. - **Impact:** Loss of sensitive faunal habitat and the potential loss of faunal SCC.

Table 8: Aspects and Activities register considering faunal ecology during the closure and decommission phase.

Closure and Decommission Phase
- Potential ineffective rehabilitation of exposed and impacted areas potentially leading to vegetation succession and a possible reduction of faunal diversity and occurrence of potential faunal SCC over the long-term. - **Impact:** Permanent loss of faunal habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural faunal habitat of increased sensitivity. Further reduction of available habitat in the long-term, compounding the limiting factors to faunal assemblages.
- Potential poor management and failure to monitor rehabilitation efforts, leading to: • Landscapes being left fragmented, resulting in reduced migration capabilities of faunal species, isolation of faunal populations and a decrease in faunal diversity; • Increased storm water run-off; • Compacted soils limiting the re-establishment of natural vegetation; and • Increased risk of erosion in areas left disturbed. - **Impact:** Long-term (or permanent) loss of faunal habitat, diversity and SCC and sedimentation of watercourses.
- Potentially poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species. - **Impact:** Permanent loss of surrounding faunal niche habitat, diversity and SCC.
- Potential overexploitation through the removal and/or collection of remaining important or sensitive faunal SCC beyond the direct footprint area on the property. - **Impact:** Local loss of faunal SCC abundance and diversity.
- Potentially poorly managed edge effects: - Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to a continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the faunal habitat; and - Potential erosion stemming from soil left bare leading to sedimentation of downslope faunal habitat. - **Impact:** Loss of faunal habitat, diversity and SCC within the direct expansion development footprint of the mine. Loss of surrounding faunal diversity and faunal SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.

5.2 Impact Assessment Results

Tables 9-11 below provide all the impact scores pre- and post-mitigation measures. It Is important to note that if ALL mitigations as stipulated in this report are not implemented, the post mitigation scoring may need to be amended.

Section 5.4 below highlights the key integrated mitigation measures that are applicable to all the mine expansion in order to suitably manage and mitigate ecological impacts to faunal species as best as possible during the planning, construction and operation and decommissioning phases.

When viewing the table below it is important to note that each project has been assessed separately in conjunction with the affected habitat units associated with the project.

Table 9: Impact on the faunal habitat, diversity and SCC from the proposed Project 1 and 2 activities.

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
PLANNING PHASE																
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland and Open Thornveld Habitats	4	3	4	3	3	**7**	**10**	**70** **Medium low**	3	3	3	2	2	**6**	**7**	**42** **Low**
Transformed Habitat	4	1	1	2	3	**4**	**6**	**24** **Very low**	1	1	1	2	2	**2**	**5**	**10** **Very Low**
Rupicolous Habitat	4	3	3	3	3	**7**	**9**	**63** **Medium low**	3	2	2	2	2	**5**	**6**	**30** **Low**
Impact on Faunal SCC																
Project 1 and 2 associated Habitats	3	3	4	3	3	**6**	**10**	**60** **Medium low**	2	3	3	2	2	**5**	**7**	**35** **Low**
CONSTRUCTION AND OPERATIONAL PHASE																
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland and Open Thornveld Habitats	5	3	3	3	5	**8**	**11**	**88** **Medium high**	3	3	3	2	4	**6**	**9**	**63** **Medium low**
Transformed Habitat	3	1	1	2	5	**4**	**7**	**28** **Low**	1	1	1	2	4	**2**	**7**	**14** **Very Low**
Rupicolous Habitat	5	3	3	3	5	**8**	**11**	**88** **Medium high**	3	3	2	2	4	**6**	**8**	**48** **Low**
Impact on Faunal SCC																
Project 1 and 2 associated Habitats	3	3	3	3	3	**6**	**9**	**54** **Medium-low**	2	3	2	2	2	**5**	**6**	**30** **Low**
CLOSURE AND REHABILITATION PHASE																
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland and Open Thornveld Habitats	5	3	3	3	5	**8**	**11**	**88** **Medium high**	3	3	3	2	4	**6**	**9**	**63** **Medium low**
Transformed Habitat	3	1	1	2	5	**4**	**8**	**32** **Low**	1	1	1	2	4	**2**	**7**	**14** **Very Low**

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
Rupicolous Habitat	5	3	3	3	5	**8**	**11**	**88** **Medium high**	3	3	2	2	4	**6**	**8**	**48** **Low**
Impact on Faunal SCC																
Project 1 and 2 associated Habitats	3	3	3	3	3	**6**	**9**	**54** **Medium-low**	2	3	2	2	2	**5**	**6**	**30** **Low**

Table 10: Impact on the faunal habitat, diversity and SCC from the proposed Project 3 activities.

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
PLANNING PHASE																
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland, Open Thornveld, Rupicolous Habitat	4	3	4	4	5	**7**	**13**	**91** **Medium high**	4	3	3	3	4	**7**	**10**	**70** **Medium low**
Watercourse Habitat	4	4	5	3	5	**8**	**13**	**104** **High**	4	4	3	2	4	**8**	**9**	**72** **Medium low**
Non-watercourse Habitat	4	4	4	3	5	**8**	**12**	**96** **Medium high**	4	4	3	2	4	**8**	**11**	**72** **Medium low**
Modified Habitat	3	2	2	3	5	**5**	**10**	**50** **Low**	3	2	1	3	3	**5**	**7**	**35** **Low**
Impact on Faunal SCC																
Project 3 associated Habitats	4	3	4	3	2	**7**	**9**	**48** **Low**	3	3	3	2	2	**6**	**7**	**42** **Low**

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
CONSTRUCTION AND OPERATIONAL PHASE																
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland, Open Thornveld, Rupicolous Habitat	5	3	4	4	5	8	13	104 High	4	3	4	3	4	7	11	77 Medium high
Cryptic Wetlands	5	4	4	4	5	9	13	117 High	4	4	3	3	3	8	9	72 Medium low
Non-watercourse Habitat	5	4	4	4	5	9	13	117 High	4	4	3	3	4	8	10	80 Medium high
Degraded Habitat	4	2	2	3	5	6	11	66 Medium low	3	2	2	3	4	5	9	72 Medium low
Transformed Habitat	3	1	1	2	5	4	8	32 Low	2	1	1	2	4	3	8	24 Very low
Impact on Faunal SCC																
Project 3 associated Habitats	3	3	3	3	3	6	9	54 Medium-low	2	3	2	2	2	5	6	30 Low
CLOSURE AND REHABILITATION PHASE																
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland, Open Thornveld, Rupicolous Habitat	4	3	4	3	4	7	11	77 Medium high	3	3	3	3	4	6	10	60 Medium low
Cryptic Wetlands	4	4	4	4	4	8	12	96 Medium high	3	4	3	3	4	7	10	70 Medium low
Non-watercourse Habitat	4	4	4	4	4	8	12	96 Medium high	3	4	3	3	4	7	10	70 Medium low
Degraded Habitat	3	2	2	3	4	5	9	45 Low	2	2	2	3	4	4	9	36 Low
Transformed Habitat	2	1	1	2	4	3	7	32 Low	2	1	1	2	4	3	8	24 Very low
Impact on Faunal SCC																
	3	3	3	3	3	6	9	54	2	3	2	2	2	5	6	30

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
Project 3 associated Habitats								Medium-low								Low

Table 11: Impact on the faunal habitat, diversity and SCC from the proposed Project 4 and 5 activities.

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
PLANNING PHASE																
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland Habitat	3	3	3	2	3	6	9	54 Medium low	2	3	2	1	3	5	6	30 Low
Preferential Flow Path	3	4	3	2	3	7	8	42 Low	2	4	2	1	3	6	6	36 Low
Degraded Habitat	2	2	2	2	3	4	7	28 Low	1	2	2	1	3	3	6	18 Very low
Transformed Habitat	2	1	1	2	3	3	6	18 Very low	1	1	1	1	3	2	5	10 Very low
Rupicolous Habitat	2	3	3	2	3	5	7	16 Very low	1	3	2	1	3	4	6	24 Very low
Impact on Faunal SCC																
Project 4 and 5 associated Habitats	2	3	2	2	3	5	7	35 Low	2	3	2	2	3	5	7	35 Low
CONSTRUCTION AND OPERATIONAL PHASE																

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland Habitat	3	3	3	2	3	**6**	**9**	**54** **Medium low**	2	3	2	1	3	**5**	**6**	**30** **Low**
Preferential Flow Path	3	4	3	2	3	**7**	**8**	**42** **Low**	2	4	2	1	3	**6**	**6**	**36** **Low**
Degraded Habitat	2	2	2	2	3	**4**	**7**	**28** **Low**	1	2	2	1	3	**3**	**6**	**18** **Very low**
Transformed Habitat	2	1	1	2	3	**3**	**6**	**18** **Very low**	1	1	1	1	3	**2**	**5**	**10** **Very low**
Rupicolous Habitat	2	3	3	2	3	**5**	**7**	**16** **Very low**	1	3	2	1	3	**4**	**6**	**24** **Very low**
Impact on Faunal SCC																
Project 4 and 5 associated Habitats	2	3	2	2	3	**5**	**7**	**35** **Low**	2	3	2	2	3	**5**	**7**	**35** **Low**
CLOSURE AND REHABILITATION PHASE																
Impact of Faunal Habitat and Diversity																
Calcrete Shrubland Habitat	3	3	3	2	3	**6**	**9**	**54** **Medium low**	2	3	2	1	3	**5**	**6**	**30** **Low**
Preferential Flow Path	3	4	3	2	3	**7**	**8**	**42** **Low**	2	4	2	1	3	**6**	**6**	**36** **Low**
Degraded Habitat	2	2	2	2	3	**4**	**7**	**28** **Low**	1	2	2	1	3	**3**	**6**	**18** **Very low**
Transformed Habitat	2	1	1	2	3	**3**	**6**	**18** **Very low**	1	1	1	1	3	**2**	**5**	**10** **Low**
Rupicolous Habitat	2	3	3	2	3	**5**	**7**	**16** **Very low**	1	3	2	1	3	**4**	**6**	**24** **Very low**
Impact on Faunal SCC																
Project 4 and 5 associated Habitats	2	3	2	2	3	**5**	**7**	**35** **Low**	2	3	2	2	3	**5**	**7**	**35** **Low**

5.3 Impact Discussion

The impact assessment was undertaken on all aspects of faunal ecology deemed likely to be affected by the proposed Beeshoek Mine expansion activities.

Separately, the five projects will vary considerably in the significance of the impact ratings on faunal ecology associated with the Beeshoek Mine. Cumulatively however, the various projects are anticipated to significantly impact on both faunal habitat and diversity within the SRA and outside of the property. Impacts to faunal SCC will largely be related to the loss of habitat and foraging grounds, with any potential species being forced out of the focus area as mining expands, potentially placing these species at increased risk as they may face increased persecution or be forced to relocate to areas of substandard habitat.

Faunal habitat and diversity will be most impacted upon during the construction and operational phases (or collectively considered the mining phase), with the closure and rehabilitation phase unlikely to reinstate the pre-mined faunal species diversity or habitat conditions, thus limiting the ability to reduce impacts on faunal ecology in the long-term.

Impacts on protected faunal species will be higher during the planning phase during which SCC should be, where feasible, rescued and relocated to areas of non-disturbance but suitable habitat. Avoidance of impacts on SCC population dynamics will, however, not be entirely possible. Impacts during the construction and operational phase can be reduced to lower impact significance on faunal SCC provided that the future opencast pit layouts are carefully planned and position so as to limit impacts to sensitive habitats whilst retaining habitat connectivity and suitable areas for SCC breeding and habitation. During closure and rehabilitation, the significance of impact on faunal species will be limited in its potential to be reduced as it is unlikely that the favourable, pre-mined habitat can be achieved with rehabilitation.

5.3.1 Impact on Habitat and Diversity

The data gathered during the site visit indicate that the habitat units associated with the SRA range from Low to Moderately High sensitivity. The proposed Beeshoek Mine expansion activities will impact on these habitat units in varying degrees and is discussed in more detail below.

Impacts from Project 1 and 2 (Consolidation of ROM Stockpiles on South Mine and amendments to the design of existing WRD's)

The activities related to Project 1 and 2 are limited in extent and will in many instances impact on habitat that is already degraded due to edge effects and / or habitat fragmentation from current mining activities. There will, however, still be a loss of faunal habitat, especially from the Calcrete Shrubland and Open Thornveld, which, provided that mitigation measures are implemented, will result in localised impact on faunal species diversity and habitat.

Prior to the implementation of mitigation measures, impact significance on faunal habitat and diversity varies between **Medium High-Medium Low** for all natural areas being impacted, to **Very Low** where habitat is already transformed or degraded. With mitigation measures implemented, the direct and indirect impacts on the faunal habitat and diversity can mostly be reduced to **Medium Low** and **Low** for the natural areas and **Low** for the transformed areas. During the closure phase post mitigation impacts are expected to range from **Very Low** to **Medium Low.**

To ensure impacts remain localised, it must be ensured that no footprint creep occurs as mining activities continue. Edge effects from mining activities and AIP proliferation must be managed.

Impacts from Project 3 (Pit expansions):

The activities associated with Project 3 will result in significant impacts to the faunal ecology (species diversity, abundance, and habitat) within the SRA, as Project 3 activities encompass the greatest area and will account for the largest extent of habitat disturbance and loss.

Prior to mitigation measures implemented, impact significance on faunal habitat and diversity varies between **High** and **Medium-High** (natural habitat areas, cryptic wetlands and non-watercourse habitat), to **Medium Low** (degraded habitat) and **Low** in areas where habitat is already transformed. With mitigation measures implemented, the direct and indirect impacts on the faunal habitat and diversity can mostly be reduced to **Low** and **Very low** for the degraded and transformed habitats, with impact significance decreasing to **Medium High-** to **Medium-Low** for the remaining habitats post mitigation. The above scoring is wholly reliant on the sound management of prospecting activities in the more sensitive habitats, and under provision that the prospecting activities and associated access roads will remain outside of the areas of increased sensitivity. Should this not be the case, the impacts to the receiving environment and will be notably higher.

Loss of natural habitat areas such as the Calcrete Shrublands, open Thornveld and rupicolous Habitat will result in the displacement of faunal species in these areas, or worst case, the death of species herein, especially smaller less mobile fauna. The proposed pit expansion adjacent to Village and BF Pits will result in the loss of two cryptic wetlands and four seasonal depressions. Given that these habitats will be lost as part of the pit expansion program, it is important to ensure that the remaining cryptic wetlands and seasonal depressions in the southern portion of the SRA, are not impacted upon by future exploration activities.

Impacts from Projects 4 and 5 (Beneficiation Project and Water Management):

The activities associated with Projects 4 and 5 are limited in extent and will mostly impact on faunal habitat and species that have already been subjected to mining related impacts and habitat degradation. Projects 4 and 5 will lead to the loss of portions of faunal habitat within the Calcrete Shrubland, rupicolous habitat and preferential flow path, which will result in small and localised impacts on faunal diversity and habitat provided mitigation measures are sufficiently implemented.

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **Medium Low** to **Very low**. With mitigation measures implemented, impacts on the faunal habitat and diversity can mostly be reduced to **Low** and **Very low** impact significance.

With mitigation measures adhered to, the proposed activities associated with Project 4 and 5 are not anticipated to have significant impacts on the faunal communities within the Beeshoek Mine.

The most significant impacts that will affect the faunal habitat integrity and species diversity within the Beeshoek Mine include, but are not limited to, the following:

- Mining activities within sensitive habitat such as cryptic wetlands, seasonal depressions and large stretches of untransformed Calcrete Shrubland;
- Continued expansion resulting in fragmented habitat and loss of habitat connectivity for faunal species;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species;
- Even with extensive rehabilitation, it is likely to result in sub-optimal recovery of pre-mining conditions, resulting in residual impacts to faunal communities; and
- Increased human populations in the surrounding area will lead (as already observed) to greater pressure on natural faunal habitat both within the Beeshoek Mine and the

surroundings, including increased incidences of poaching and snaring on mine property.

5.3.2 Impacts on SCC

The Beeshoek Mine and many sections of the focus area are associated with faunal SCC which may be impacted on by the proposed mine expansion activities. Only one SCC was observed on site during the field assessments, namely *Ardeotis kori* (Kori Bustard, VU, TOPS). This species was observed in the Calcrete Shrubland in the southern section of the mine, however, given its inherent mobility, is likely to utilise large sections of natural habitat within the mining property, notably for foraging. A burrow of what may be *Pterinochilus* sp (Baboon Spider) was observed along the western boundary of the waste rock dump in the southern portion of the mine, however this could not be confirmed. This species is listed as Specially Protected under the NCNCA (2009) and as such, may require permits to rescue and relocate prior to any ground clearing activities taking place.

Overall, a low diversity of SCC are expected within the focus area, likely due to the inherent arid nature of the region and the pre-existing impacts stemming from mining and farming activities. Without mitigation implemented, the anticipated impact significance on faunal SCC communities is between **Medium Low and Low**, decreasing to **Low** significance post mitigations measures for all mining operations.

Mining activities associated with Project 3 are anticipated to impact on faunal SCC to a greater extent in comparison to Projects 1, 2, 4 and 5, and as such, care must be taken to ensure that all mitigation and management measures are carried out. Not all faunal SCC can be rescued and relocated, notably avifaunal species. Mammal species may, to a degree be suitable candidates for such, however it is likely that as clearance activities start taking place, these species will naturally relocate themselves. Smaller invertebrate SCC are less capable of relocating, especially burrow dwelling species. A suitable rescue and relocation plan should be developed for such species, with pre-walk downs of the development footprints being undertaken prior to vegetation clearance to identify and mark locations of SCC.

5.3.3 Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are likely. The following points highlight the key residual impacts that have been identified:

- Permanent loss of niche faunal habitat (cryptic wetlands and seasonal depressions);
- Permanent loss of and altered faunal species diversity;

- Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation;
- The ongoing loss of SCC/protected faunal species and suitable habitat for such species; and
- It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to pre-mining levels being unlikely.

5.3.4 Cumulative Impacts

The current mine structure traverses north to south through the central portions of the focus area, limiting faunal species movement between the far eastern and western land portions. Small corridors of potential connectivity do still remain, however the new proposed mine expansion will reduce these, further impacting on species movement. The proposed expansion plan in the western of the SRA will lead to significant numbers of faunal species relocating to more suitable habitat which can be found both adjacent to the current mining areas and in the south of the SRA, leading to increased pressure on the remaining open spaces and food resources in these areas. Further, mining activities in the region have already contributed to loss of habitat in the region, importantly the loss of niche habitat such as the cryptic wetlands and the seasonal depressions. Such habitat loss has led to widespread species population declines in the region, to which the proposed expansion activities will only compound. The displacement of faunal species currently inhabiting the focus area into the surrounding vegetated areas will likely lead to increased competition for territories and breeding sites. Moreover, there is likely to be a knock-on dispersal affect, leading to increased resource competition and possible increased mortality rates, resulting in decreased species abundances and possible further loss of species diversity beyond that of the mine property.

5.4 Integrated Impact Mitigation

The table below highlights the key integrated mitigation measures that are applicable to the proposed expansion projects in order to manage, minimise and mitigate the ecological impacts where possible that are associated with the construction, operation phases and closure of the activities. Provided that all the management and mitigation measures as stipulated in this report are implemented the perceived impacts to faunal diversity, habitat and faunal SCC can minimised.

Table 12: A summary of the mitigatory requirements for faunal resources

Project phase	*Planning Phase*
Impact Summary	*Loss of faunal habitat, species diversity and SCC*
Proposed mitigation and management measures:	
Faunal Habitat and Diversity - At all times, ensure that sound environmental management and engineering is in place during the planning phase; - Minimise loss of indigenous vegetation where possible through refining the final footprints of the opencast pits, optimising the design within habitat of lowered ecological importance and sensitivity, avoiding sensitive habitats and ensuring habitat connectivity and movement corridors remain; - Planning and design, notably for future prospecting, should aim to avoid the cryptic wetlands and seasonal depressions whilst maintaining habitat connectivity as far as possible; - Ensure that prior to project commencement a suitable rescue and relocation plan, alien plant control plan and rehabilitation plan are already in place; and - Prior to vegetation clearing activities in the natural vegetation units the site should be inspected for the presence of mammal and scorpion burrows, reptiles and baboon spiders. If located, these species should be carefully flushed out or excavated ensuring no harm to the specimens, and relocated to similar surrounding habitat outside of the disturbance footprint area.	
Project phase	*Construction and Operational Phase*
Impact Summary	*Loss of faunal habitat, species and faunal SCC*
Proposed mitigation and management measures:	
General Mitigation Measures - All future prospecting activities should remain outside if the cryptic wetlands and the seasonal depressions, including their regulated zones;; - Ensure habitat connectivity is not compromised by maintaining movement corridors between the various habitat units as far as possible; - The development footprint should be demarcated, and it should be ensured that no mining related activities take place outside of the demarcated footprint; - Faunal habitat beyond the demarcated area should not be cleared or altered; - All areas of increased ecological sensitivity beyond the approved footprint must be designated as No-Go areas and be off-limits to all unauthorised construction vehicles and personnel; - Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal; - No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility; - If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line and faunal recolonization. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil; - Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the study site during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or staff member. For larger venomous snakes, a suitably trained official or specialist should be contacted to affect the relocation of the species, should it not move off on its own; - It is recommended that a monitoring program be developed during the operational phase to detect any changes to species compositions in the area, and where appropriate initiate mitigation / management measures to minimise impacts to these species; - No informal fires are to be allowed; - No hunting/trapping or collecting of faunal species is allowed; and - Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area. **Edge effect Management** - To limit edge effect impacts to the surrounding natural habitat, the below guidelines must be followed: - Demarcating all footprint areas during construction activities; - No construction rubble to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; - All soils compacted as a result of construction activities should be ripped, profiled and reseeded; - Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities; - Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil;	

- Manage the spread of AIP species and bush encroachers, which may affect remaining natural habitat within surrounding areas; and
- Ongoing alien and invasive plant monitoring and clearing/control should take place throughout all phases of the project activities. The project perimeters should regularly be checked for AIP proliferation to prevent spread into surrounding natural areas.

Faunal SCC

- It is recommended that prior to vegetation clearing and earth moving activities a walkdown is conducted in order to ascertain the possible presence of faunal SCC and where feasible effect the relocation of such species provided the correct rescue and relocation permits are in place;
- A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist should SCC be identified within the focus area in order to ensure that species loss during construction activities is kept to a minimum;
- Should any other faunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) be encountered, construction should be halted and authorisation to relocate such species must be obtained from relevant authorities; and
- No collection of faunal SCCs may be allowed by construction or operational personnel.

Rehabilitation

- When rehabilitating a footprint site, it is imperative that as far as possible the habitat that was present prior to disturbances is improved, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area; and
- Rehabilitation must be implemented concurrently as per the rehabilitation plan, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and costs associated with it.

Project phase	*Closure and Decommissioning Phase*
Impact Summary	*Loss of faunal habitat, species and faunal SCC*

Proposed mitigation and management measures:

- Ensure that no further clearing of faunal habitat occurs;
- No hunting/trapping or collecting of faunal species is allowed;
- No informal fires by any personnel are allowed;
- Following heavy rains, all stormwater structures and erosion susceptible areas must be inspected, and any damage or early onset erosion rectified;
- Monitor the success of rehabilitation efforts of all areas that were disturbed and revegetated during the operational phase;
- Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase, and the immediate surrounding area (30m from the perimeters) should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural areas. Alien vegetation control must be monitored. The alien floral control plan must be implemented for a period of at least 5 years after decommissioning and closure; and
- Continue with and update the alien and invasive plant control plan accordingly.

Rehabilitation

- Any infrastructure and reclamation operation footprints should be rehabilitated in accordance with a rehabilitation plan compiled by a suitable specialist;
- All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure objective;
- Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure; and
- The rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during and once construction or operation has been completed. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and cost.

5.5 Impact Statement on planned Exploration

The Beeshoek Mine has provided a 5-year exploration plan (Figure 13) of drill sites / borehole placement for which STS was requested to provide an impact statement.

The proposed 5-year plan mostly falls within the Calcrete Shrubland and Modified Habitat, with smaller sections of Rupicolous Habitat, Cryptic Wetlands, Seasonal Depressions and Open Thornveld also targeted for exploration. The exploration activities will result in loss of habitat but with a restricted, localised impact that can be rehabilitated. The current 5-year plan has aimed to avoid Cryptic Wetlands as far as possible which will ensure that these specialised and niche habitats remain intact and functional.

There are five key ecological impacts on the receiving environment that are anticipated to occur based on the 5-year exploration plan, namely:

1. Loss of vegetation and potential displacement of faunal SCC within the impacted sites;
2. In response to the disturbance caused by the exploration drilling, there will be an increased risk of proliferation of alien vegetation which will alter and impact the areas ability to support faunal species;
3. Increased sedimentation of the Cryptic Wetlands as a result of disturbances to the soils, impacting on these niche habitats and their ability to support faunal species reliant on these systems;
4. Fragmentation of habitat in the event that the disturbed areas are not rehabilitated or temporary roads are constructed for exploration vehicles to get to and from the drill sites; and
5. Potential contamination of soils and surface water.

Recommendations, in addition to the “good housekeeping practices”, required to minimise the impact on the faunal ecology of the area, should the exploration drilling proceed, are provided below:

Planning and layout

- Limit the footprint area of each exploration site (including the placement of temporary infrastructure and access roads) to what is absolutely essential in order to minimise the loss of habitat, compaction of soils, erosion and potential increase of surface water runoff;
- The footprint areas of all surface infrastructure (e.g., truck parking area, low grade stockpiles etc.) must remain as small as possible within the parameters of operational and engineering requirements. It is strongly recommended that during the planning

phase, layout and positioning of infrastructure and boreholes take into consideration the sensitivity map within this report;

- As far as possible, all drilling activities (including any creation of soil or vegetation stockpiles and any temporary structures as part of the drilling rig) must remain in well-planned, demarcated areas so to minimise the footprint area;
- All drilling activities must be strictly managed in a responsible manner in line with the mitigation hierarchy; and
- Access to the drilling sites for the transport of the drilling equipment and samples should make use of existing roads as far as possible.

Habitat management

- Ensure that all spills are immediately cleaned up;
- No dumping of waste should take place within the natural habitat areas;
- All material and waste must be removed from site upon the completion of exploration at each site;
- An alien vegetation control program should be implemented. Alien plant invasion is expected within any disturbed areas, and therefore regular monitoring and control of alien invasive vegetation should take place in accordance with the EMPr;
- Edge effects must be monitored and managed;
- All areas affected by topsoil stockpiling (from sump excavation) or vegetation stockpiling (vegetation clearance) during the operational phase of the drilling activities should be rehabilitated; and
- Upon completion of drilling activities all access roads which are no longer required must be rehabilitated, and all drilling related equipment should be removed. Compacted soils should be ripped and revegetated with indigenous vegetation to prevent erosion, sheet runoff, and to discourage the establishment of AIPs after the operational phase.

Given the above, provided that the exploration activities avoid sensitive habitat associated with the Cryptic Wetlands and the Seasonal Depressions, and that areas are rehabilitated post-drilling, the impact on faunal ecology in these aras may remain minimal. It is however important to ensure that should any faunal SCC be affected by exploration activities, the necessary permits must be sought from the relevant authorities (DENC and/or DFFE). Avoiding unnecessary loss of faunal habitat must be prioritised and the areas that are disturbed by exploration activities must be rehabilitated and edge effect impacts prevented.

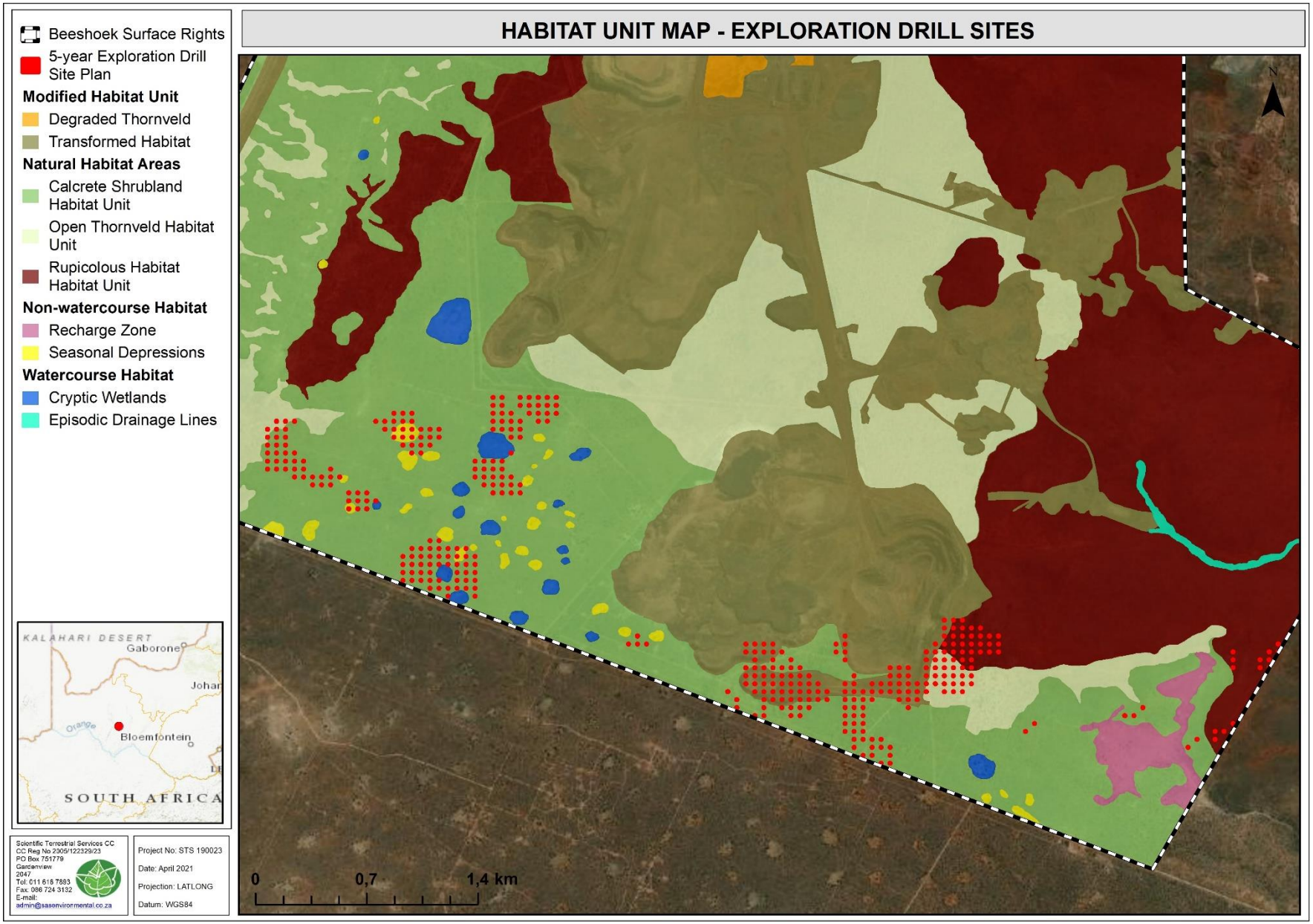


Figure 13: Beeshoek Mine 5-year exploration plan.

6. CONCLUSION

STS was appointed to conduct a Biodiversity and Impact Assessment as part of the EIA and Authorisation process for the Consolidation, Upgrade and Expansion Activities at the Assmang (Pty) Ltd Beeshoek Iron Ore Mine, which was split into five (5) projects:

- **Project 1**: Consolidation of Run of Mine (ROM) Stockpiles on South Mine.
- **Project 2**: Amendments to the design of existing Waste Rock Dumps (WRDs) in terms of the increase in heights, and allowance for final slope, which will result in extension of footprints.
- **Project 3**: Increase of Opencast footprint areas, as well as the undertaking of detrital mining for shallow iron ore reserves, including transportation routes (Haul roads).
- **Project 4 & 5** – Beneficiation Project and Water Management project.

Habitat and species summaries:

Based on the results of the field investigation that was undertaken across various seasons, namely 10-13 June 2019 (winter assessment), 22–24 January 2020 (summer assessment), and 1-5 March 2021 (early autumn), the following habitat units were distinguished for the Beeshoek Mine SRA:

Natural Habitat Areas comprising of:

- Calcrete Shrubland;
- Open Thornveld; and
- Rupicolous Habitat;

Modified Habitat Areas comprising of:

- Degraded Thornveld Habitat; and
- Transformed Habitat;

Watercourse Habitat comprising of:

- Cryptic Wetlands; and
- Episodic Drainage Lines.

Non-watercourse habitat comprising of:

- Preferential Flow Paths;
- Recharge Zone; and
- Seasonal Depressions.

The natural habitats were the dominant habitats within the SRA, providing the largest extent of faunal habitat and food resources. It is these habitats that will be subjected to the greatest loss of habitat due to the proposed opencast pit expansions. It is important to note that the

water course and non-watercourse habitats in the SRA are important in that they provide niche habitat to faunal species that are often not observed in the other habitats of the SRA, notably amphibians. Additionally, these habitats due to the increased moisture content of the soils, often have greater vegetation growth for longer periods of the year, providing important and vital food resources to herbivorous species.

Based on conservation significance, presence of SCC and the level of habitat degradation, the faunal sensitivity of the habitat units indicate that the Modified Habitat Unit is of **Low and Moderately Low Sensitivity**, the Natural Habitats are of **Intermediate Sensitivity** and the Watercourses and Non-watercourses of **Moderately High Sensitivity**.

Impact summary:
Separately, the five projects will vary considerably in the significance of the impact ratings on faunal ecology associated with the Beeshoek Mine. Collectively, the impacts are anticipated to be significant on both faunal habitat and diversity, as well as on potential faunal SCC.

In terms of faunal habitat and diversity, the construction and operational phases (mining phase) will have the greatest impacts dur to extensive vegetation clearing activities leading to habitat loss, species displacement and potential increased mortality rates relating to vehicle collisions and earth moving activities. The closure and rehabilitation phase poses a lower impact significance, yet unlikely it is unlikely that rehabilitation will reinstate the pre-mined faunal habitat and species diversity. It is imperative that all mitigation and management measures be implemented in order to reduce impacts to the receiving environment throughout all phases of the mine.

It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the Borrow Pits will be made in support of the principle of sustainable development.

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APPENDIX A: Faunal Method of Assessment

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of anthropogenic activities near the Focus area may have an impact on faunal behaviour and in turn the rate of observations. In order to increase overall observation time within the Focus area, as well as increasing the likelihood of observing shy and hesitant species, Sherman traps were strategically placed within the Focus area. Sherman traps were used to increase the likelihood of capturing and observing small mammal species, notably small nocturnal mammals.

Mammals

Small mammals are unlikely to be directly observed in the field because of their nocturnal/crepuscular and cryptic nature. A simple and effective solution to this problem is to use Sherman traps. A Sherman trap is a small aluminium box with a spring-loaded door (Figure A1). Once the animal is inside the trap, it steps on a small plate that causes the door to snap shut, thereby capturing the individual. In the event of capturing a small mammal during the night, the animal would be photographed and then set free unharmed early the following morning. Traps were baited with a universal mixture of oats, peanut butter, and fish paste.

Figure A1: Sherman trap and bait used to capture and identify small mammal species.

Furthermore, mammal species were recorded during the field assessment with the use of visual identification, spoor, call and dung. Specific attention was given to mammal SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Avifauna

The Southern African Bird Atlas Project 2 database (http://sabap2.adu.org.za/) was compared with the recent field survey of avifaunal species identified in the Focus area. Field surveys were undertaken utilising direct observation and bird call identification techniques in order to accurately identify avifaunal species. Specific attention was given to avifaunal SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Reptiles

Reptiles were identified during the field survey. Suitable applicable habitat areas (rocky outcrops and fallen dead trees) were inspected and all reptiles encountered were identified. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which reptile species are likely to occur on the Focus area. Specific attention was given to reptile SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Amphibians

Identifying amphibian species is done by the use of direct visual identification along with call identification technique. Amphibian species flourish in and around wetland, riparian and moist grassland

areas. It is unlikely that all amphibian species will have been recorded during the site assessment, due to their cryptic nature and habits, varied stages of life cycles and seasonal and temporal fluctuations within the environment. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which amphibian species are likely to occur within the Focus area as well as the surrounding area. Specific attention was given to amphibian SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Invertebrates

Whilst conducting transects through the Focus area, all insect species visually observed were identified, and where possible photographs taken. Pitfall traps was also utilised during the site assessment and all insect species captured identified, photographed and set free.

It must be noted however that due to the cryptic nature and habits of insects, varied stages of life cycles and seasonal and temporal fluctuations within the environment, it is unlikely that all insect species will have been recorded during the site assessment period. Nevertheless, the data gathered during the assessment along with the habitat analysis provided an accurate indication of which species are likely to occur in the Focus area at the time of the survey. Specific attention was given to insect SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Arachnids

Suitable applicable habitat areas (rocky outcrops, sandy areas and fallen dead trees) where spiders and scorpions are likely to reside were searched. Rocks were overturned and inspected for signs of these species. Specific attention was paid to searching for Mygalomorphae arachnids (Trapdoor and Baboon spiders) as well as potential SCC scorpions within the Focus area.

Faunal Species of Conservation Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC is described:

- "**Confirmed'**: if observed during the survey;
- "**High**": if within the species' known distribution range and suitable habitat is available;
- "**Medium**": if either within the known distribution range of the species or if suitable habitat is present; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Faunal Habitat Sensitivity

The sensitivity of the Borrow Pits for each faunal class (i.e. mammals, birds, reptiles, amphibians and invertebrates) was determined by calculating the mean of five different parameters which influence each faunal class and provide an indication of the overall faunal ecological integrity, importance and sensitivity of the Borrow Pits for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Faunal SCC:** The confirmed presence or potential for faunal SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Habitat Availability:** The presence of suitable habitat for each class;
- **Food Availability:** The availability of food within the Borrow Pits for each faunal class;
- **Faunal Diversity:** The recorded faunal diversity compared to a suitable reference condition such as surrounding natural areas or available faunal databases; and
- **Habitat Integrity:** The degree to which the habitat is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the suitability and sensitivity of the Borrow Pits for each faunal class. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the Borrow Pits in relation to each faunal class. The different classes and land-use objectives are presented in the table below:

Table A1: Faunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1.0 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit ar surrounds while optimising development potential.
≥3.5<4.5	Moderately high	Preserve and enhance the biodiversity of the habitat un limit development and disturbance.
≥4.5 ≤ 5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX B: Faunal SCC

NEMBA TOPS List (2007)

Scientific Name	Common Name
CRITICALLY ENDANGERED SPECIES	
REPTILIA	
Caretta	Loggerhead Sea Turtle
Dermochelys coriacea	Leatherback Sea Turtle
Eretmochelys imbricate	Hawksbill Sea Turtle
AVES	
Grus carunculatus	Wattled Crane
Hirundo atrocaerulea	Blue Swallow
Neophron percnopterus	Egyptian Vulture
Poicephalus robustus	Cape Parrot
MAMMALIA	
Bunolagus monticularis	Riverine Rabbit
Chrysospalax	Rough-haired Golden Mole
ENDANGERED SPECIES	
REPTILIA	
Chelonia mydas	Green Turtle
Cordylus giganteus	Giant Girdled Lizard
Lepidochelys olivacea	Olive Ridley Turtle
Psammobates geometricus	Geometric Tortoise
AVIFAUNA	
Anthropoides paradiseus	Blue Crane
Balearica regulorum	Grey Crowned Crane
Ephippiorhynchus senegalensis	Saddle-billed Stork
Gypaetus barbatus	Bearded Vulture
Gyps africanus	White-backed Vulture
Gyps coprotheres	Cape Vulture
Necrosyrtes	Hooded Vulture
Pelecanus rufescens	Pink-backed Pelican
Scotopelia peli	Pel's Fishing Owl
Torgos tracheliotus	Lappet-faced Vulture
MAMMALIA	
Amblysomus robustus	Robust Golden Mole
Damaliscus tunatus	Tsessebe
Diceros bicornis	Black Rhinoceros
Equus zebra	Mountain Zebra
Lycaon pictus	African Wild Dog
Neamblysomus gunningi	Gunning's Golden Mole
Ourebia ourebi	Oribi
Paraxerus palliatus	Red Squirrel
Petrodromus tetradactylus	Four-toed Elephant-shrew
VULNERABLE SPECIES	
AVES	
Trigonoceps occipitalis	White-headed Vulture
Aquila rapax	Tawny Eagle
Ardeotis kori	Kori Bustard
Ciconia nigra	Black Stork
Circaetus fasciolatus	Southern Banded Snake Eagle
Eupodotis caerulescens	Blue Korhaan
Falco fasciinucha	Falcon
Falco naumanni	Lesser Kestrel

Scientific Name	Common Name
Falco peregrinus	Peregrine Falcon
Geronticus calvus	Bald Ibis
Neotis ludwidii	Ludwig's Bustard
Polemaetus bellicosus	Martial Eagle
Terathopius ecaudatus	Bateleur
Tyto capensis	Grass Owl
MAMMALIA	
Acinonyx jubatus	Cheetah
Chrysospalax trevelyani	Giant Golden Mole
Cricetomys gambianus	Giant Rat
Damaliscus pyrgorgus pygargus	Bontebok
Dendrohyrax arboreus	Tree Hyrax
Hippotragus equinus	Roan Antelope
Pholidota temminckii	Pangolin
Neamblysomus julianae	Juliana's Golden Mole
Neotragus moschatus	Suni
Panthera leo	Lion
Panthera pardus	Leopard
Philantomba monticola	Blue Duiker
PROTECTED SPECIES	
AMPHIBIA	
Pyxicephalus adspersus	Giant Bullfrog
Pyxicephalus edulis	Afiican Bullfrog
REPTILIA	
Bitis gabonica	Gaboon Adder
Bitis schneideri	Namaqua Dwarf Adder
Bradypodion taeniabronchum	Smith's Dwarf Chameleon
Cordylus cataphractus	Girdled Lizard
Crocodylus niloticus	Nile crocodile
Python natalensis	African Rock Python
AVES	
Bucowus leadeateri	Southern Ground-Hornbill
Circus ranivorus	African Marsh Harrier
Neotis denhami	Denham's Bustard
Spheniscus	Jackass Penguin
MAMMALIA	
Atelerix frontalis	South African Hedgehog
Ceratotherium simum	White Rhinoceros
Connochaetes	Black Wildebeest
Crocuta	Spotted Hyaena
Felis nigripes	Black-footed Cat
Parahyaena brunnea	Brown Hyaena
Leptailurus serval	Serval
Loxodonta africana	African elephant
Lutra maculicollis	Spotted-necked Otter
Millivora capensis	Honey Badger
Raphicerus sharpei	Sharpe's Grysbok
Redunca	Reedbuck
Vulpes chama	Cape **Fox**

Table B1: Avifaunal Species for the pentad 2815_2255 and 2820_2255 within the QDS 2822BD as well pentads 2815_2300 and 2820_2300 within the QDS 2823AC.

Pentads	Link to pentad summary on the South African Bird Atlas Project 2 web page
2815_2255	http://sabap2.adu.org.za/coverage/pentad/2815_2255
2820_2255	http://sabap2.adu.org.za/coverage/pentad/2820_2255
2815_2300	http://sabap2.adu.org.za/coverage/pentad/2815_2300
2820_2300	http://sabap2.adu.org.za/coverage/pentad/2820_2300

APPENDIX C: Faunal Species List

Table C1: Mammal species recorded during the field assessment.

Scientific Name	Common Name	Status
Canis mesomelas	Black-backed Jackal	LC
Sylvicapra grimmia	Common duiker	LC
Lepus saxatilis	Scrub hare	LC
Xerus inauris	Ground Squirrel	LC
Phacochoerus africanus	Warthog	LC
Cynitis penicillata	Yellow Mongoose	LC
Tragelaphus strepsiceros	Kudu	LC
Micaelamys namaquensis	Namaqua Rock Mouse	LC
Procavia capensis	Rock Dassie	LC
Elephantulus sp.	Elephant Shrew	LC
Raphicerus campestris	Steenbok	LC
Hystrix africaeaustralis	Porcupine	LC

LC = Least concerned. NT = Near Threatened, VU = Vulnerable NYBA = Not yet been assessed by the IUCN.

Table C2: Avifaunal species recorded during the field assessment.

Scientific name	Common name	Status
Streptopelia capicola	Cape turtledove	LC
Pycnonotus nigricans	Red-eyed Bulbul	LC
Columba guinea	Speckled pigeon	LC
Philetairus socius	Sociable Weaver	LC
Uraeginthus granatinus	Violet eared waxbill	LC
Mirafra fasciolata	Fawn-coloured Lark	LC
Urocolies indicus	Red-faced Mousebird	LC
Colies	White-backed Mousebird	LC
Tyto alba	Western barn Owl	LC
Ploceus velatus	Southern masked weaver	LC
Laniarius astrococcineus	Crimson-breasted shrike	LC
Sylvietta rufescens	Long-billed crombec	LC
Upupa africana	African Hoopoe	LC
Spilopelia senegalensis	Laughing Dove	LC
Tachybaptus ruficollis	Little Grebe	LC
Anas erythrorhyncha	Red-billed Teal	LC
Himantopus	Black-winged Stilt	LC
Tedorna cana	South African Shelduck	LC
Anas capensis	Cape Teal	LC
Anas Smithii	Cape Shoveler	LC
Gallinula chloropus	Common Moorhen	LC
Struthio camelus	Ostrich	LC
Afrotis afraoides	Northern Black Korhaan	LC
Sylvia subcaerulea	Chestnut-vented tit-babbler	LC
Calendulauda sabota	Sabota Lark	LC
Prinia masulosa	Karoo Prinia	LC
Emberiza impetuani	Lark-like Bunting	LC
Tricholaema leucomelas	Acacia Pied Barbet	LC

Scientific name	Common name	Status
Serinus flaviventris	Yellow Canary	LC
Quelea	Red-billed Quelea	LC
Plocepasser mahali	White-browed Sparrow-weaver	LC
Alopochen aegyptiacus	Egyptian Goose	LC
Crithagra albogularis	White-throated Canary	LC
Crithagra atrogularis	Black-throated Canary	LC
Passer melanurus	Cape Sparrow	LC
Sporopipes squamifrons	Scaly-feathered Weaver	LC
Onychognathus nabouroup	Pale Winged Starling	LC
Saxicola torquata	African Stonechat	LC
Anthus cinnamomeus	African Pipit	LC
Sigelus silens	Fiscal Flycatcher	LC
Erythropygia paena	Kalahari scrub Robin	LC

LC = Least concerned. NT = Near Threatened, VU = Vulnerable NYBA = Not yet been assessed by the IUCN.

Table C3: Reptile species recorded during the field assessment.

Scientific name	Common Name	Status
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	LC
Stigmochelys pardalis	Leopard Tortoise	LC
Agama aculeata aculeata	Common Ground Agama	LC
Nucras intertexta	Spotted Sandveld Lizard	LC
Bitis arietans arietans	Puff Adder	LC
Trachylepis spilogaster	Kalahari tree skink	LC

LC = Least Concern, NYBA = Not Yet Been Assessed

Table C4: General invertebrate recorded during the field assessment.

Scientific Name	Common Name	Status
Hodotermes mossambicus	Northern harvester termite	NYBA
Passalidius fortipes	Burrowing ground beetle	NYBA
Acanthoplus discoidalis	Brown Armoured Corncricket	NYBA
Apterogyna sp.	Velvet ant	NA
Africallagma glaucum	Swamp Bluet	LC
Stips sp.	Ridged seed beetle	NYBA
Gonometa postica	African silk moth	NYBA
Calidea dregii	Rainbow Shield Bug	NYBA
Trinervitermes sp.	Snouted Harvester Termite	NA
Zophosis sp.	Frantic Tortoise Beetle	NA
Acrotylus sp	Burrowing grasshopper	NA
Conistica saucia	Rock Grasshopper	NYBA
Sphingonotus scabriculus	Blue-wing	NYBA
Acanthacris ruficornis	Garden Locust	NYBA
Anacridium moestum	Tree Locust	NYBA
Heteronitis sp.	Grooved Dung Beetle	NA
Gastrimargus sp.	N/A	NYBA
Rhachitopis sp	N/A	NYBA
Systophlochius palochius	Orange wing	NYBA
Anterhynchium fallax	N/A	NYBA
Camponotus fulvopilosus	Bal-byter	NYBA

Scientific Name	Common Name	Status
Crematogaster peringueyi	Cocktail Ant	NYBA
Pantala flavescens	Wandering Glider	LC
Phymateus sp.	Milkweed Locust	NA
Asilidae (*Neolophonotus* sp)	Robber fly	NA
Mylabris oculata	CMR Bean Beetle	NYBA

LC = Least Concern, NYBA = Not yet been assessed by the IUCN

Table C5: Arachnid species recorded during the site assessment.

Scientific Name	Common Name	Status
Hirriusa sp.	Ground-running Spider	NA
Theuma sp	Pale Ground Spider	NA
Pterinochilus sp (Not confirmed)	Golden-brown Baboon Spider	Specially Protected
Uroplectes carinatus	Common Lesser-thicktail	LC
Parabuthus granulatus	Rough Thicktail	LC
Uroplectes carinatus	Common Lesser-Thicktail Scorpion	NYBA
Solifugae sp	Sun spider	NA

LC = Least Concern, NYBA = Not Yet Been Assessed, NA = Not applicable

Table C6: Amphibian species observed or expected(*).

Scientific name	Common Name	Status
*Breviceps adspersus**	Bushveld rain frog	Least Concern
*Vandijkophrynus gariepensis gariepensis**	Karoo toad	Least Concern
Kassina senegalensis	Bubbling Kassina	Least Concern
*Tomopterna cryptotis**	Tremolo Sand Frog	Least Concern
*Sclerophrys/Amietophrynus poweri**	Powers toad	Least Concern

, NYBA = Not yet been assessed by the IUCN.